UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 100

Course Title: Environmental Biology Credit Hours: 3

Date of Final Approval: _____ Semester Offered: F/SP

Course counts as: ✓ general education requirement
_____ part of _____ major program
_____ elective

1. **Catalog Description:** This is a one-semester course in general principles of environmental biology, conservation of the environmental, and human ecology. It does not count as credit toward a biology major, but does count as credit toward the general education requirements. This course consists of three-hours of lecture weekly. The lab, BI 100L, MUST be taken concurrently. Corequisite: BI 100L
2. **Course Content:** Focus is on Pacific Island environments and the local and global threats to the environment. Various island ecosystems are described and visited on field trips; e.g., limestone forest, savanna, reefs. Principles of ecosystem structure and function are introduced, such as predator prey relations and the concept of habitat. Part II covers populations: principles of population growth and decline;pests, endangered species, sustainable harvest of renewal resources. Non-living renewable resources are also covered, including Guam's water source and energy alternatives. Part III includes aspects of aspects of population of air, sea, freshwater, and land; solid waste disposal and hazardous waste, and population aspects of resource exploitation (e.g., oil spills). Throughout, solutions are examined, including individual action in recycling and resource conservation, ecotourism, and ethical and philosophical aspects of our relationship with our environment. Environmental issues in the news are analyzed and discussed.
3. **Rationale for the Course:** This course is to provide credits toward the general education requirement in science. It is an important course for island citizens in general, and provides strong links to disciplines such as communication, education and business
4. **Skills and Background Required or Expected:** The course assumes no science background, but does require students to have college-level English skills
5. **Teaching Methodologies and Anticipated Class Size:** Students meet learning goals by doing a series of coordinated activities. They have a variety of ways to learn basic concepts and develop higher-level thinking skills about issues and problems in their environment. Short (20 min.) lectures are used to present concepts which students work on in small groups in class and/or as homework assignments. Field trips provide experiences of the natural environments and the problems threatening them. Video programs shows stories from the world at large that are anchored into the local experience through local newspaper stories. All field trips and videos have study guides and worksheets. Cultural connection links issues raised in the course to the respect for the land that is embodied in the *taotaomona's* environmental ethic and valuation of indigenous knowledge.

   Anticipated class size: There are now four lab sections and two lecture sections during fall and spring semesters, with about 120 students each semester; the course also typically runs twice in summer with about 30 students each time.

6. **Learning Objectives for Students:**

A. The successful student will demonstrate the following essential science **skills:**
   1. Answer questions about the data in scientific graphs and tables;
   2. Propose hypotheses to solve environmental questions;
   3. Collect and analyze data for a simple study, interpret the results and write a report in scientific style;
   4. Describe the process of science to show how hypotheses are tested, how theories are supported or modified by evidence, and how the public should determine and respond to the differing levels of certainty in various theories.

B. The successful student will demonstrate application of the following **core ideas** to interpret current

environmental issues:

1. Observation and comparison are methods in biological research that are as valid as doing controlled experiments; in some areas of science controlled experiments are impractical or impossible.
2. Scientific conclusions are judgments not proofs, so the level of confidence in a conclusion (probability of being right) must be expressed with appropriate tentative language. *Corollary*: Scientific hypotheses and theories can be revised on the basis of new evidence.
3. A theory in science is a well-supported and broad-based consensus built on many lines of evidence from tested hypotheses.
4. The patterned complexity of living systems is hierarchically organized; higher levels in the hierarchy are characterized by the emergence of new properties. *Corollary*: Ecosystems cannot be fully understood by study of their component parts.
5. Carbon and other materials are continually recycled through food webs but energy must be constantly supplied anew (usually from the sun).
6. Introduced species and habitat destruction are among the most serious threats to island ecosystems.
7. Global warming and sea level rise are certainly happening and are very likely (more than 90% certainty) due to human increases in greenhouse gases, especially carbon dioxide

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

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7. **Methods of Evaluation:** Students complete about 30 activity/assignment sheets (including field trips and videos). There are three one-hour tests during the semester.

8. **Methods for Student Learning Outcomes Assessment:** Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. **Required and Recommended Texts or Study Guides:** Lobban/Schefter, Tropical Pacific Island Environments

10. **Subsequent Courses:** None in environmental science, but relevant to courses in economics, philosophy, geography, etc.

11. **Additional Course Descriptors, if any:**

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 100L

Course Title: Environmental Biology Laboratory Credit Hours: 1

Date of Final Approval: _____ Semester Offered: F/SP

Course counts as: ✓ general education requirement
_____ part of _____ major program
_____ elective

1. Catalog Description:

BI 100L is the laboratory portion of BI 100 and MUST be taken concurrently. The course consists of one three-hour laboratory per week. Corequisite: BI 100

2. Course Content:

Focus is on Pacific Island environments and the local and global threats to the environment. Various island ecosystems are described and visited on field trips; e.g., limestone forest, savanna, reefs. Principles of ecosystem structure and function are introduced, such as predator prey relations and the concept of habitat. Part II covers populations: principles of population growth and decline;pests, endangered species, sustainable harvest of renewal resources. Non-living renewable resources are also covered, including Guam's water source and energy alternatives. Part III includes aspects of aspects of population of air, sea, freshwater, and land; solid waste disposal and hazardous waste, and population aspects of resource exploitation (e.g., oil spills). Throughout, solutions are examined, including individual action in recycling and resource conservation, ecotourism, and ethical and philosophical aspects of our relationship with our environment. Environmental issues in the news are analyzed and discussed.

3. Rationale for the Course:

This course is to provide credits toward the general education requirement in science. It is an important course for island citizens in general, and provides strong links to disciplines such as communication, education and business

4. Skills and Background Required or Expected:

The course assumes no science background, but does require students to have college-level English skills

5. Teaching Methodologies and Anticipated Class Size:

Students meet learning goals by doing a series of coordinated activities. They have a variety of ways to learn basic concepts and develop higher-level thinking skills about issues and problems in their environment. Short (20 min.) lectures are used to present concepts which students work on in small groups in class and/or as homework assignments. Field trips provide experiences of the natural environments and the problems threatening them. Video programs shows stories from the world at large that are anchored into the local experience through local newspaper stories. All field trips and videos have study guides and worksheets. Cultural connection links issues raised in the course to the respect for the land that is embodied in the *taotaomona's* environmental ethic and valuation of indigenous knowledge.

Anticipated class size: There are now four lab sections and two lecture sections during fall and spring semesters, with about 120 students each semester; the course also typically runs twice in summer with about 30 students each time.

6. Learning Objectives for Students:

A. The successful student will demonstrate the following essential science **skills:**

1. Answer questions about the data in scientific graphs and tables;
2. Ppropose hypotheses to solve environmental questions;
3. Collect and analyze data for a simple study, interpret the results and write a report in scientific style;
4. Describe the process of science to show how hypotheses are tested, how theories are supported or modified by evidence, and how the public should determine and respond to the differing levels of certainty in various theories.

B. The successful student will demonstrate application of the following **core ideas** to interpret current environmental issues:

1. Observation and comparison are methods in biological research that are as valid as doing controlled experiments; in some areas of science controlled experiments are impractical or impossible.
2. Scientific conclusions are judgments not proofs, so the level of confidence in a conclusion (probability of being right) must be expressed with appropriate tentative language. *Corollary*: Scientific hypotheses and theories can be revised on the basis of new evidence.
3. A theory in science is a well-supported and broad-based consensus built on many lines of evidence from tested hypotheses.
4. The patterned complexity of living systems is hierarchically organized; higher levels in the hierarchy are characterized by the emergence of new properties. *Corollary*: Ecosystems cannot be fully understood by study of their component parts.
5. Carbon and other materials are continually recycled through food webs but energy must be constantly supplied anew (usually from the sun).
6. Introduced species and habitat destruction are among the most serious threats to island ecosystems.
7. Global warming and sea level rise are certainly happening and are very likely (more than 90% certainty) due to human increases in greenhouse gases, especially carbon dioxide

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

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7. Methods of Evaluation:

Students complete about 30 activity/assignment sheets (including field trips and videos). There are three one-hour tests during the semester.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

10. Subsequent Courses:

None in environmental science, but relevant to courses in economics, philosophy, geography, etc.

11. Additional Course Descriptors, if any:

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 120

Course Title: Scientific Prose Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. Catalog Description:

Effective reading and summarizing of scientific prose and accompanying illustrations, including textbook, science articles, and laboratory reports. Scientific topics complement those in BI 157 or BI 158 Principles of Biology courses. This is the first of three Science Communication courses. Prerequisite: BI 157 (completed or concurrent) or permission of professor.

2. Course Content:

In Scientific Prose (Science Communication 1), students focus on effectively reading scientific prose and the accompanying illustrations. Visual representations of scientific data, concepts, and the processes studied include prose, tables, charts, and diagrams. To better organize information from scientific text, students will analyze topic sentences and cohesion, and use scaffolding and reading strategies. Linguistic tools include subtleties of tentative language (hedging) to qualify inductive conclusions; professional ethics require scientists to be explicit about the degree of certainty of their conclusions and to incorporate information from other studies without either plagiarism or distortion.

Scientific topics complement those in the coordinated BI 157 Principles of Biology course. SciComm 1 offers students tools to assist in transferring and building on previous learning and comparing information from multiple sources. Current topics will include two or three themes to complement BI 157. The sequence of SciComm courses buildings on required English courses.

3. Rationale for the Course:

Effective scientific communication skills are essential for success in Biology. Undergraduate biology students and people working in science are expected to read science -first textbooks, then reports and journal articles - and to summarize research, to write personal statements for career goals, and to write laboratory reports. Communication via journal articles is essential for scientific progress, as scientists argue for or refine concepts, introduce new species, share results of observations, conclusions, and methods of testing hypotheses. Scientists, including peer reviewers, judge the conclusions based on the results presented; they judge the merit of the work based on the “gap” it fills and the quality of the research as documented in the paper.

Systematic lessons prepare students to build on their existing skills and apply them to support learning goals in this and other biology courses. The Biology program goals were written to align with national curriculum expectations, including an explicit component of science communication. Since scientific English is a particularly difficult form of Academic English, many universities offer students disciplinary language courses.

Science Communication courses provide explicit support for Biology BA program goals #4 (Communication) and #5 (Digital Literacy).

4. Skills and Background Required or Expected:

Students must be enrolled in (or have completed) BI 157 Principles of Biology. Students uncertain about being ready for the course should consult the professor for suggestions to improve their skills.

5. Teaching Methodologies and Anticipated Class Size:

Teaching methodologies: Students will have the opportunity to learn from several methods in a workshop format with mini-lectures assisted by PowerPoint visuals, in-class and homework discussions with peers, guided practice with skills, Problem Based Learning and participation in and written reflection on lectures by at least two visiting or local researchers - likely scheduled by the Biology Club, UOG Marine Lab, Professors, CLASS Research Conference, or Guam Haggan Watch outside of our class time. Students will begin assignments in class. Class will be held in the UOG NIH RISE Science computer lab, SC 117 so that students have access to online materials including other textbooks.

Anticipated class size: 16

6. Learning Objectives for Students:

Successful students in Science Communications 1 will --

1. Use critical thinking skills including, to extract key concepts, explain or use scaffolding to summarize, make inferences, and identify supporting evidence in scientific prose and the accompanying illustrations at the level of introductory biology and from scientific literature written for the educated public (e.g., *Scientific American).*
2. Discuss key characteristics and consequences of the scientific paradigm including methods, processes, linguistic insights e.g., Tentative Language for degrees of certainty, the need for criteria, and Responsible Conduct of Research; explain and effectively use the structure of scientific laboratory reports and journal articles.
3. Process scientific information in multiple formats via computer, using desktop competencies including word processing and email.

*Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Homework, seatwork, in-class and take-home tests, scientific drawings, self assessment.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation

9. Required and Recommended Texts or Study Guides:

Texts depend on availability of suitable textbooks year to year and on teacher-made materials. __[As more recent texts that better support the intended learning outcomes become available, they may be substituted].

Lobban & Schefter. 1992. *Successful Lab Reports.*

Solomon, Berg & Martin. 2005. *Biology,* 7th ed. (the BI 157/158 text)

Study Guide to Solomon, Berg & Martin. 2005. *Biology*, 7th ed.

Lewis, N. (1979). *Word Power Made Easy.* New York, Simon & Schuster.

10. Subsequent Courses:

BI 320 Biodiversity Photomicroscopy and BI 321 Scientific Argument (Science Communication 2 and 3); BI 503 (Scientific Literature and Writing).

11. Additional Course Descriptors, if any:

Sources of scientific literature include biology textbooks, and laboratory reports, most including visual representations.

Students will receive assistance on planning, writing and presenting their laboratory reports for Principles of Biology.

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

JtD Updated April 1, 2008

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 124

Course Title: Human Anatomy & Physiology I Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: _____ general education requirement
_____ part of _____ major program
_____ elective
__X__ part of Biology Support Program for Nursing

1. **Catalog Description:** This is the first part of a 2-semester course in the study of the structure and function of the human body. This part will examine the integumentary, skeletal, muscular, and nervous systems from the level of cells, to tissues, to organs, to the whole organism. Homeostatic control mechanisms in the healthy human for these systems will be stressed. The course includes 3 hours of lecture each week. The lab, BI 124L, SHOULD be taken concurrently. Prerequisite/Corequisite: EN 110; Corequisite: BI 124L.

2. **Course Content:** The course begins with an overview of the human body. This is quickly followed by a review of chemistry and then moves on to explore the cellular and tissue levels of organization. The class then explores the covering, support, and movement of the body through investigation of the integumentary, muscular, and skeletal systems. Finally the class will examine the structure, regulation, and integration of the body systems by learning about the nervous system. Topics are generally covered in the order they are presented in the textbook.

3. **Rationale for the Course:** An in-depth understanding and knowledge of the structure and function of the human body is crucial to the development of those wishing to enter many health-related and sport-related fields. It is also essential to those who wish to promote better health at the personal or family level. Knowledge of basic anatomy and physiology will enable students to be informed health-care consumers and to form their own conclusions about public health issues.

   The lab component is a co-requisite and an integral part of the learning process, even though students register for it as a separate course.

4. **Skills and Background Required or Expected:**

5. **Teaching Methodologies and Anticipated Class Size:**

   Anticipated class size: 2 sections of 60 students each.

6. **Learning Objectives for Students:**

   During or by the end of the course students will be able to (as evaluated through written quizzes, tests, and exams):

   1. identify the components and subcomponents of the integumentary, skeletal, muscular, and nervous systems;
   2. recognize the functional relationships within and among the integumentary, skeletal, muscular, and nervous systems in maintaining homeostasis;
   3. recall the cytology and histology of human cells, tissues, and organs;
   4. recognize and interpret the relationships between chemistry and physiology as they relate to cellular and sub-cellular processes; such as enzyme activity, cell-membrane function, muscle contraction, and nervous system control; and
   5. apply basic knowledge of anatomy and physiology to demonstrate and infer the complementarity of structure and function when the body exhibits homeostasis and during pathological deviations from homeostasis.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. **Methods of Evaluation:** Student learning and knowledge is evaluated through quizzes, tests, a comprehensive midterm, and a comprehensive final exam.

8. **Methods for Student Learning Outcomes Assessment:** Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test, Course-embedded questions, Standardized exams, Portfolio Evaluation, Direct Observation, and Capstone Course Evaluation.

9. **Required and Recommended Texts or Study Guides:** The current textbook is *Human Anatomy & Physiology* (7th edition) by EN Marieb and K Hoehn. The textbook comes with a pre-paid subscription to "The Anatomy & Physiology Place" at http://www.anatomyandphysiology.com. In addition, *A Brief Atlas of the Human Body* (2nd edition) by M Hutchinson, J Mallatt, EN Marieb, and PB Wilhelm is bundled with the text.

   Many students find that the *Anatomy& Physiology Coloring Workbook: A complete study guide* (9th edition) by EN Marieb is a relatively painless introduction to learning the basics of human anatomy.

10. **Subsequent Courses:** BI 125: Human Anatomy & Physiology II.

11. **Additional Course Descriptors, if any:**

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

DRAFT—Newly Proposed with SLO Amendment & Addition of new section 8

College: College of Natural and Applied Sciences Course Number: BI 124L

Course Title: Human Anatomy & Physiology I Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: _____ general education requirement
_____ part of _____ major program
_____ elective
__X__ part of Biology Support Program for Nursing

1. **Catalog Description:** This is the laboratory portion of BI 124. The lab consists of one 3-hour session per week. The lecture, BI 124, SHOULD be taken concurrently. Corequisite: BI 124.

2. **Course Content:** The course begins with an overview of the human body. This is quickly followed by a review of chemistry and then moves on to explore the cellular and tissue levels of organization. The course then explores the covering, support, and movement of the body through investigation of the integumentary, muscular, and skeletal systems. Finally the course will examine the structure, regulation, and integration of the body systems by learning about the nervous system. Topics are generally covered in the order they are presented in the lab manual (and textbook).

3. **Rationale for the Course:** An in-depth understanding and knowledge of the structure and function of the human body is crucial to the development of those wishing to enter many health-related and sport-related fields. It is also essential to those who wish to promote better health at the personal or family level. Knowledge of basic anatomy and physiology will enable students to be informed health-care consumers and to form their own conclusions about public health issues.

   The lab is an integral part of the learning process, even though students register for it as a separate course. The lab supports learning in the lecture part of the course; for example, by allowing students to touch and feel the structures that they have heard about in lecture. The lab component provides the experiential side of the course to improve students' skills in observation, interpretation, integration, and analysis.

4. **Skills and Background Required or Expected:**

5. **Teaching Methodologies and Anticipated Class Size:**

   Anticipated class size: 6 sections of 20 students per lab.

6. **Learning Objectives for Students:**

   During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

   1. record, analyze, and interpret data from computer-simulated laboratory exercises on cell transport, skeletal muscle physiology, and neurophysiology;
   2. dissect, differentiate, locate, and identify on a cat components and subcomponents of the integumentary, muscular, and nervous systems; and describe the differences between cats and humans in these systems;
   3. identify cells and tissue types using compound microscopes and photomicrographs;
   4. identify the major organs and their associated structures of the integumentary, skeletal, muscular, and nervous

systems using models, specimens, and diagrams;

5. demonstrate appropriate use and care of the microscope; and
6. demonstrate basic dissection techniques and laboratory safety.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. **Methods of Evaluation:** Student knowledge and learning is evaluated through homework assignments, quizzes, and lab practicals (2 of which, the midterm and final, are comprehensive), and an evaluation of the care and skill of completed dissections.

8. **Methods for Student Learning Outcomes Assessment:** Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test, Course-embedded questions, Standardized Exams, Portfolio Evaluation, Direct Observation, and Capstone Course evaluation.

9. **Required and Recommended Texts or Study Guides:** The current manual for the lab is *Human Anatomy & Physiology Laboratory Manual—Cat Version* (9th edition) by EN Marieb and SJ Mitchell. Homework assignments will come directly from the lab manual. The lab manual comes with a pre-paid subscription to "MyA&P" at http://www.myaandp.com/. In addition, *A Brief Atlas of the Human Body* (2nd edition) by M Hutchinson, J Mallatt, EN Marieb, and PB Wilhelm is bundled with the text.

   Many students find that the *Anatomy& Physiology Coloring Workbook: A complete study guide* (9th edition) by EN Marieb is a relatively painless introduction to learning the basics of human anatomy.

   For the lab, students will also need to purchase a dissecting kit. This kit MUST have a pair of scissors with 2 fine tips and fine forceps. In addition, it is a good idea to protect your clothes in the lab. Wearing an old (and slightly large) shirt that will cover your clothes is the easiest and cheapest solution. Lab coats may be available for sale at Tools of the Trade.

10. **Subsequent Courses:** BI 125L: Human Anatomy & Physiology II Lab.

11. **Additional Course Descriptors, if any:**

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

DRAFT—Newly Proposed with SLO Amendment & Addition of new section 8

College: College of Natural and Applied Sciences Course Number: BI 125

Course Title: Human Anatomy & Physiology II Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Spring

Course counts as: _____ general education requirement
_____ part of _____ major program
_____ elective
__X__ part of Biology Support Program for Nursing

1. **Catalog Description:** This is the second part of a 2-semester course in the study of the structure and function of the human body. This part will examine the nervous, endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems from the level of cells, to tissues, to organs, to the whole organism. Homeostatic control mechanisms in the healthy human for these systems will be stressed. The course includes 3 hours of lecture each week. The lab, BI 125L, SHOULD be taken concurrently. Prerequisite: BI 124; Corequisite: BI 125L.

2. **Course Content:** The course begins where BI 124 (Human Anatomy & Physiology I) ended, usually with the special senses. The course then moves on to regulation and integration of the body systems by examining the endocrine system. Next the class will examine maintenance of the body through the cardiovascular, lymphatic, immune, respiratory, digestive, and urinary systems. Finally the course will investigate the continuity of life through an examination of the reproductive system, development, and heredity. Topics are generally covered in the order they are presented in the textbook.

3. **Rationale for the Course:** An in-depth understanding and knowledge of the structure and function of the human body is crucial to the development of those wishing to enter many health-related and sport-related fields. It is also essential to those who wish to promote better health at the personal or family level. Knowledge of basic anatomy and physiology will enable students to be informed health-care consumers and to form their own conclusions about public health issues.

   The lab component is a co-requisite and an integral part of the learning process, even though students register for it as a separate course.

4. **Skills and Background Required or Expected:**

5. **Teaching Methodologies and Anticipated Class Size:**

   Anticipated class size: 2 sections of 60 students each.

6. **Learning Objectives for Students:**

   During or by the end of the course students will be able to (as evaluated through written quizzes, tests, and exams):

   1. identify the components and subcomponents of the sensory, endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems;
   2. recognize the functional relationships within and among the sensory, endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems in maintaining homeostasis;
   3. recognize and interpret the relationships between chemistry and physiology as they relate to cellular and sub-cellular processes; such as vision, olfaction, taste, and hearing, hormone action, antigen-antibody reactions, heart function, lung function, nutrition, metabolism and temperature regulation, and fluid, electrolyte and acid-base balance;
   4. apply basic knowledge of anatomy and physiology to demonstrate the complementarity of structure and function when the body exhibits homeostasis and during pathological deviations from homeostasis;

5. apply basic knowledge of metabolic pathways and their links to energy production and storage to the function of the respiratory, digestive, and urinary systems; and
6. recognize the detailed roles that the nervous and endocrine systems play in coordinating and integrating the function of the human body.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation: Student knowledge and learning is evaluated through quizzes, tests, a comprehensive midterm, and a comprehensive final exam.

8. Methods for Student Learning Outcomes Assessment: Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test, Course-embedded questions, Standardized Exams, Portfolio Evaluation, Direct Observation, and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides: The current textbook is *Human Anatomy & Physiology* (7th edition) by EN Marieb and K Hoehn. The textbook comes with a pre-paid subscription to "The Anatomy & Physiology Place" at http://www.anatomyandphysiology.com. In addition, *A Brief Atlas of the Human Body* (2nd edition) by M Hutchinson, J Mallatt, EN Marieb, and PB Wilhelm is bundled with the text.

Many students find that the *Anatomy& Physiology Coloring Workbook: A complete study guide* (9th edition) by EN Marieb is a relatively painless introduction to learning the basics of human anatomy.

10. Subsequent Courses: BI 225: Basic Microbiology.

11. Additional Course Descriptors, if any:

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

DRAFT—Newly Proposed with SLO Amendment & Addition of new section 8

College: College of Natural and Applied Sciences Course Number: BI 125L

Course Title: Human Anatomy & Physiology II Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Spring

Course counts as: _____ general education requirement
_____ part of _____ major program
_____ elective
__X__ part of Biology Support Program for Nursing

1. **Catalog Description:** This is the laboratory portion of BI 125. The lab consists of one 3-hour session each week. The lecture, BI 125, SHOULD be taken concurrently. Corequisite: BI 125.

2. **Course Content:** The course begins where BI 124 (Human Anatomy & Physiology I) ended, usually with the special senses. The course then moves on to regulation and integration of the body systems by examining the endocrine system. Next the class will examine maintenance of the body through the cardiovascular, lymphatic, immune, respiratory, digestive, and urinary systems. Finally the course will investigate the continuity of life through an examination of the reproductive system, development, and heredity. Topics are generally covered in the order they are presented in the lab manual (and textbook).

3. **Rationale for the Course:** An in-depth understanding and knowledge of the structure and function of the human body is crucial to the development of those wishing to enter many health-related and sport-related fields. It is also essential to those who wish to promote better health at the personal or family level. Knowledge of basic anatomy and physiology will enable students to be informed health-care consumers and to form their own conclusions about public health issues.

   The lab is an integral part of the learning process, even though students register for it as a separate course. The lab supports learning in the lecture part of the course; for example, by allowing students to touch and feel the structures that they have heard about in lecture. The lab component provides the experiential side of the course to improve students' skills in observation, interpretation, integration, and analysis.

4. **Skills and Background Required or Expected:**

5. **Teaching Methodologies and Anticipated Class Size:**

   Anticipated class size: 6 sessions of 20 students per lab.

6. **Learning Objectives for Students:**

   During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

   1. record, analyze, and interpret data from computer-simulated laboratory exercises on endocrine system physiology, blood analysis, cardiovascular dynamics, cardiovascular physiology, respiratory system mechanics, chemical and physical processes of digestion, renal system physiology and acid-base balance;
   2. dissect, differentiate, locate, and identify on a cat components and subcomponents of the endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary, and reproductive systems; and describe the differences between cats and humans in these systems;
   3. identify the major organs and their associated structures of the sensory, endocrine, cardiovascular, lymphatic, immune, respiratory, digestive, urinary, and reproductive systems using slides, models, specimens, photomicrographs, and diagrams;
   4. describe the pathway of blood through the heart, urine through the kidneys, food through the digestive system, and

egg and sperm through the reproductive system (through fertilization); and

5. demonstrate basic dissection techniques and laboratory safety.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation: Student knowledge and learning is evaluated through homework assignments, quizzes, and lab practicals (2 of which, the midterm and final, are comprehensive), and an evaluation of the care and skill of completed dissections.

8. Methods for Student Learning Outcomes Assessment: Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test, Course-embedded questions, Standardized Exams, Portfolio Evaluation, Direct Observation, and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides: The current manual for the lab is *Human Anatomy & Physiology Laboratory Manual—Cat Version* (9th edition) by EN Marieb and SJ Mitchell. Homework assignments will come directly from the lab manual. The lab manual comes with a pre-paid subscription to "MyA&P" at http://www.myaandp.com/. In addition, *A Brief Atlas of the Human Body* (2nd edition) by M Hutchinson, J Mallatt, EN Marieb, and PB Wilhelm is bundled with the text.

Many students find that the *Anatomy& Physiology Coloring Workbook: A complete study guide* (9th edition) by EN Marieb is a relatively painless introduction to learning the basics of human anatomy.

For the lab, students will need to have the use of a dissecting kit. This kit MUST have a pair of scissors with 2 fine tips and fine forceps. In addition, it is a good idea to protect your clothes in the lab. Wearing an old (and slightly large) shirt that will cover your clothes is the easiest and cheapest solution. Lab coats are available for sale at Tools of the Trade.

10. Subsequent Courses: BI 225L: Basic Microbiology Lab.

11. Additional Course Descriptors, if any:

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 157

Course Title: Principles of Biology I Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: X general education requirement
X part of Biology major program
X elective

1. **Catalog Description:** The first semester of a two-semester course covers vocabulary and some processes. It is required of all biology majors and may be used by others to satisfy the general education requirements. It includes three hours of lecture weekly. The lab, BI 157L, MUST be taken concurrently. Corequisite: BI 157L

2. **Course Content:**

   Introduces the basic vocabulary of biology and physical sciences and the topics of evolution, basic chemistry, cell structure and function, taxonomy and phylogeny of the five kingdoms and immunology

3. **Rationale for the Course:**

   Introduces biology to the general student. The first two basic semesters provide a foundation of information, vocabulary and skills for the biology major. Provides information suitable for the premed, etc. student to pass the MCATs, etc.

4. **Skills and Background Required or Expected:** None

5. **Teaching Methodologies and Anticipated Class Size:**

   Lecture sections are taught by lecture; student recall is encouraged by questioning. Lab sessions are hands-on activities to demonstrate the principles/information provided in lecture.

   Anticipated class size: Class size about 80 students; 40 students per lab

6. **Learning Objectives for Students:**

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Define and apply scientific terms related to evolution, taxonomy, phylogeny, plate tectonics, basic chemistry, the cell, embryology and immunology;
2. Utilize lab techniques of microscopy and dissection to observe and characterize biological materials; and
3. Apply writing and quantitative skills to prepare a scientific paper (lab report) using data from measurements of the growth of corn and bean seeds, including graphing.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. Methods of Evaluation:

Weekly tests and quizzes
Hour exams
Laboratory reports
Cumulative final exam

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Biology; 8th edition, Publisher: Brooks/Cole, Author: Solomon, Berg Cole & Martin
Dictionary of Word Roots & Combining Forms, Newest edition, Publisher: Mayfield, Author: Boror
Learning Skills for the Science Student, Newest Edition, Publisher: H.H. Publishing Co., Author: Bosworth

10. Subsequent Courses:

BI 158

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 157L

Course Title: Principles of Biology I Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: X general education requirement
X part of Biology major program
X elective

1. Catalog Description:

BI 157L is the laboratory portion of BI 157 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI 157

2. Course Content:

Introduces the basic vocabulary of biology and physical sciences and the topics of evolution, basic chemistry, cell structure and function, taxonomy and phylogeny of the five kingdoms and immunology

3. Rationale for the Course:

Introduces biology to the general student. The first two basic semesters provide a foundation of information, vocabulary and skills for the biology major. Provides information suitable for the premed, etc. student to pass the MCATs, etc

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4. Skills and Background Required or Expected: None

5. Teaching Methodologies and Anticipated Class Size:

Lecture sections are taught by lecture; student recall is encouraged by questioning. Lab sessions are hands-on activities to demonstrate the principles/information provided in lecture.

Anticipated class size: Class size about 80 students; 40 students per lab

6. Learning Objectives for Students:

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Define and apply scientific terms related to evolution, taxonomy, phylogeny, plate tectonics, basic chemistry, the cell, embryology and immunology;
2. Utilize lab techniques of microscopy and dissection to observe and characterize biological materials; and
3. Apply writing and quantitative skills to prepare a scientific paper (lab report) using data from measurements of the growth of corn and bean seeds, including graphing.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. Methods of Evaluation:

Weekly tests and quizzes
Hour exams
Laboratory reports
Cumulative final exam

8. Methods for Student Learning Outcomes Assessment: :

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams;Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Biology; 8th edition, Publisher: Brooks/Cole, Author: Solomon, Berg Cole & Martin
Dictionary of Word Roots & Combining Forms, Newest edition, Publisher: Mayfield, Author: Boror
Learning Skills for the Science Student, Newest Edition, Publisher: H.H. Publishing Co., Author: Bosworth
Biological Investigations in the Laboratory, 4th. edition, Publisher: W.W. Norton & Co., Author: Keeton, Dabnet & Philpott

10. Subsequent Courses:

BI 158

11. Additional Course Descriptors, if any:

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 158

Course Title: Principles of Biology II Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Spring

Course counts as: X general education requirement
X part of Biology major program
X elective

1. Catalog Description:

This second semester of a two-semester course covers fundamental processes from biochemistry through physiology. It is required of all biology majors and may be used by others to satisfy the general education requirements. It includes three hours of lecture weekly. The lab, BI 158L, MUST be taken concurrently. Corequisite: BI 158L

2. Course Content:

Basic vocabulary of biology and physical sciences. Introduces the topics and processes of cellular energetics and biochemistry, genetics, plant and animal physiology, behavior and ecology.

3. Rationale for the Course:

Continues the introduction of biology to the general student. The second of two basic semesters providing a foundation o f information, vocabulary and skills for the major. Provides information suitable to prepare the pre-med student, etc. for their MCATs, etc.

4. Skills and Background Required or Expected:

Vocabulary and lab experience found in BI 157, especially some familiarity with basic chemistry.

5. Teaching Methodologies and Anticipated Class Size:

Lecture sections are taught by lecture; student recall is encouraged by questioning. Lab sessions are hands-on activities to demonstrate the principles/information provided in lecture.

Anticipated class size: Class size about 60 students; 30 students per lab

6. Learning Objectives for Students:

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Identify and write about processes of photosynthesis, respiration, plant and animal physiology, behavior and ecology, and characterize the steps of processes in an organized manner;

2. Utilize lab techniques of experimentation, microscopy and dissection to characterize processes & structures involved in 1. above; and
3. Apply writing and quantitative skills to produce, with a partner, a scientific paper (ecology report) utilizing information obtained by observations and/or experimentation in the field, and present this paper as a class seminar using posters, power point and/or other forms of communication.
4. Implement quantitative skills for introductory genetics, e.g., diagram crosses, ratios of genotypes and phenotypes, calculate Chi Square and determine degrees of freedom and probability.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. Methods of Evaluation:

Weekly tests and quizzes
Hour exams
Laboratory reports
Cumulative final exam

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Biology; 8th edition, Publisher: Brooks/Cole, Author: Solomon, Berg Cole & Martin
Dictionary of Word Roots & Combining Forms, Newest edition, Publisher: Mayfield, Author: Boror
Learning Skills for the Science Student, Newest Edition, Publisher: H.H. Publishing Co., Author: Bosworth
Biological Investigations in the Laboratory, 4th. edition, Publisher: W.W. Norton & Co., Author: Keeton, Dabnet & Philpott
A Guide to Biology Lab, 3rd. edition, Publisher: Lebco Graphics; Author: Rust

10. Subsequent Courses:

BI 157 and BI 158 are prerequisites for all biology courses for the major

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 158L

Course Title: Principles of biology II Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Spring

Course counts as: X general education requirement
X part of Biology major program
X elective

1. Catalog Description:

BI 158L is the laboratory portion of BI 158 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI 158

2. Course Content:

Basic vocabulary of biology and physical sciences. Introduces the topics and processes of cellular energetics and biochemistry, genetics, plant and animal physiology, behavior and ecology.

3. Rationale for the Course:

Continues the introduction of biology to the general student. The second of two basic semesters providing a foundation o f information, vocabulary and skills for the major. Provides information suitable to prepare the pre-med student, etc. for their MCATs, etc.

4. Skills and Background Required or Expected:

Vocabulary and lab experience found in BI 157, especially some familiarity with basic chemistry.

5. Teaching Methodologies and Anticipated Class Size:

Lecture sections are taught by lecture; student recall is encouraged by questioning. Lab sessions are hands-on activities to demonstrate the principles/information provided in lecture.

Anticipated class size: Class size about 60 students; 30 students per lab

6. Learning Objectives for Students:

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Identify and write about processes of photosynthesis, respiration, plant and animal physiology, behavior and ecology, and characterize the steps of processes in an organized manner;

2. Utilize lab techniques of experimentation, microscopy and dissection to characterize processes & structures involved in 1., above; and
3. Apply writing and quantitative skills to produce, with a partner, a scientific paper (ecology report) utilizing information obtained by observations and/or experimentation in the field, and present this paper as a class seminar using posters, power point and/or other forms of communication.
4. Implement quantitative skills for introductory genetics, e.g., diagram crosses, ratios of genotypes and phenotypes, calculate Chi Square and determine degrees of freedom and probability.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. Methods of Evaluation:

Weekly tests and quizzes

Hour exams

Laboratory reports

Cumulative final exam

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Biology; 8th edition, Publisher: Brooks/Cole, Author: Solomon, Berg Cole & Martin

Dictionary of Word Roots & Combining Forms, Newest edition, Publisher: Mayfield, Author: Boror

Learning Skills for the Science Student, Newest Edition, Publisher: H.H. Publishing Co., Author: Bosworth

Biological Investigations in the Laboratory, 4th. edition, Publisher: W.W. Norton & Co., Author: Keeton, Dabnet & Philpott

A Guide to Biology Lab, 3rd. edition, Publisher: Lebco Graphics; Author: Rust

10. Subsequent Courses:

BI 157 and BI 158 are prerequisites for all biology courses for the major

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 212

Course Title: Oceanography Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Spring

Course counts as: X general education requirement
_____ part of _____ major program
X elective

1. Catalog Description:

Oceanography is an introductory survey of the physics, geology, meteorology, chemistry, and biology of the oceans and their sediments, including sampling techniques and methods of analysis. The course consists of three hours of lecture weekly. The lab, BI 212L, MUST be taken concurrently. Prerequisites: Consent of instructor. Corequisite: BI 212L

2. Course Content:

See attached syllabus

3. Rationale for the Course:

To familiarize the student with basic knowledge, new concepts, and methods of study of ocean geology, physics, chemistry and biology.

4. Skills and Background Required or Expected:

5. Teaching Methodologies and Anticipated Class Size:

Lecture, demonstration, audio-visuals, laboratory instruction, field trips.

Anticipated class size: Maximum class size is 28

6. Learning Objectives for Students:

During or by the end of the course students will be able to:
1. Demonstrate knowledge about major geological, physical, chemical, and biological features and processes in the oceans.
2. Describe examples of major processes, such as seafloor spreading, El Nino, upwelling, tidal fluctuations, where they occur in the oceans geographically and why they are important.
3. Interpret and use common representations of ocean features (maps, graphs, diagrams of the sea floor, the water column, the sea surface, etc.).
4. Evaluate significant ocean and coastal problems that impact public policy debates.

5. Identify and critically appraise the scientific content of relevant media discussions of oceanographic issues, particularly along the Oregon coast.
6. Develop a greater appreciation for ocean management, conservation, and protection, globally.
7. Understand the nature, value, and limitations of scientific methods at sea and on shore (this will be discussed in lecture and experienced firsthand in lab).

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. Methods of Evaluation:

Take-home essay exams (2), a term paper, and a final exam

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Oceanography – An Invitation to Marine Science; Author: Tom S. Garrison, 2005 Edition; Publisher: Thomson/Brooks Cole

10. Subsequent Courses:

BI 225, 410

11. Additional Course Descriptors, if any:

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 212L

Course Title: Oceanography Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Spring

Course counts as: X general education requirement
_____ part of _____ major program
X elective

1. Catalog Description:

BI 212L is the laboratory portion of BI 212 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI 212

2. Course Content:

See attached syllabus

3. Rationale for the Course:

To familiarize the student with basic knowledge, new concepts, and methods of study of ocean geology, physics, chemistry and biology.

4. Skills and Background Required or Expected:

5. Teaching Methodologies and Anticipated Class Size:

Lecture, demonstration, audio-visuals, laboratory instruction, field trips.

Anticipated class size: Maximum class size is 28*Anticipated class size:*

6. Learning Objectives for Students:

During or by the end of the course students will be able to:
1. Demonstrate knowledge about major geological, physical, chemical, and biological features and processes in the oceans.
2. Describe examples of major processes, such as seafloor spreading, El Nino, upwelling, tidal fluctuations, where they occur in the oceans geographically and why they are important.
3. Interpret and use common representations of ocean features (maps, graphs, diagrams of the sea floor, the water column, the sea surface, etc.).
4. Evaluate significant ocean and coastal problems that impact public policy debates.
5. Identify and critically appraise the scientific content of relevant media discussions of oceanographic issues, particularly along the Oregon coast.
6. Develop a greater appreciation for ocean management, conservation, and protection, globally.

7. Understand the nature, value, and limitations of scientific methods at sea and on shore (this will be discussed in lecture and experienced firsthand in lab).

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. Methods of Evaluation:

Take-home essay exams (2), a term paper, and a final exam

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

10. Subsequent Courses:

BI 225, 410

11. Additional Course Descriptors, if any:

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 225

Course Title: Basic Microbiology Credit Hours: 4

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: _____ general education requirement
_____X_____ part of Pre-Nursing major program
_____ elective

1. Catalog Description:

This course is a survey of the characteristics and significance of microorganisms from environmental, industrial, and medical perspectives. It includes two 2-hour laboratories and 3 hours of lecture weekly. Prerequisite: BI 157-157L and BI 158-158L or BI 124-124L and BI 225-225L with grade of C, a year of college chemistry, and may be repeated with permission of instructor.

2. Course Content:

(1) Microbial cell biology. (2) Microbial genetics. (3) Interactions and impact of microorganisms and humans. (4) Interactions and impact of microorganisms in the environment. (5) Integrating Themes.

3. Rationale for the Course:

To provide the required microbiology course for the Nursing Major and as an elective for biology and environmental science majors.

4. Skills and Background Required or Expected:

Pre-requisites: BI 157/157L and BI 158/158L or BI 124/124L and BI 125/125L with grade of "C"; and completion of 1 year of Chemistry (CH 100/100L and CH 101/101L or CH 102/102L and CH 103/103L; and consent of instructor.

5. Teaching Methodologies and Anticipated Class Size:

Lecture, demonstration, audio-visuals, laboratory instruction, field trips.

Anticipated class size: Maximum class size is 40 without overload

6. Learning Objectives for Students:

1. Microbial cell biology:
- Information flow within a cell
- Regulation of cellular activities
- Cellular structure and function
- Growth and division
- Cell energy metabolism

2. Microbial genetics:
- Inheritance of genetic information
- Cause, consequences and uses of mutations
- Exchange and acquisition of genetic information

3. Interactions and impact of microorganisms and humans:
- Host defense mechanisms
- Microbial pathogenicity mechanisms
- Disease transmission
- Antibiotics and chemotherapy
- Genetic engineering
- Biotechnology

4. Interactions and impact of microorganisms in the environment:
- Adaptation and natural selection
- Symbiosis
- Microbial recycling of resources
- Microbes transforming environment

5. Integrating Themes:
- Microbial evolution
- Microbial diversity

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. Methods of Evaluation:

a) Quizzes……about 17 in lab
b) Exams……..4 take-home essay exams
c) Reports…….Three

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Microbiology, An Introduction, 9th. edition or latest, Author: Tortora, Funke & Case, Publisher: Benjamin Cummings

10. Subsequent Courses:

BI 315, 410, 416, & 419

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 225L

Course Title: Basic Microbiology Lab Credit Hours: 0

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: _____ general education requirement
X part of Pre-Nursing major program
_____ elective

1. Catalog Description:

BI 225L is the laboratory portion of BI 225 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI 225

2. Course Content:

(1) Use a bright field light microscope to view and interpret slides. (2) Properly prepare slides for microbiological examination. (3) Properly use aseptic techniques for the transfer and handling of microorganisms and instruments. (4) Use appropriate microbiological media and test systems

3. Rationale for the Course:

To provide the required microbiology course for the Nursing Major and as an elective for biology and environmental science majors.

4. Skills and Background Required or Expected:

Pre-requisites: BI 157/157L and BI 158/158L or BI 124/124L and BI 125/125L with grade of "C"; and completion of 1 year of Chemistry (CH 100/100L and CH 101/101L or CH 102/102L and CH 103/103L; and consent of instructor.

5. Teaching Methodologies and Anticipated Class Size:

Lecture, demonstration, audio-visuals, laboratory instruction, field trips.

Anticipated class size: Maximum class size is 40 without overload

6. Learning Objectives for Students:

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams) demonstrate the ability

1. Use a bright field light microscope to view and interpret slides, including
- Correctly setting up and focusing the microscope
- Proper handling, cleaning, and storage of the microscope
- Correct use of all lenses
- Recording microscopic observations

2. Properly prepare slides for microbiological examination, including
- Cleaning and disposing of slides
- Preparing smears from solid and liquid cultures
- Performing wet mount and/or hanging drop preparations
- Performing Gram stains

3. Properly use aseptic techniques for the transfer and handling of microorganisms and instruments, including
- Sterilizing and maintaining sterility of transfer instruments
- Performing aseptic transfer
- Obtaining microbial samples

4. Use appropriate microbiological media and test systems, including
- Isolating colonies and/or plaques
- Maintaining pure cultures

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

a) Quizzes……about 17 in lab
b) Exams……..4 take-home essay exams
c) Reports…….Three

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:
Microbiological Application-Complete Version, 10th edition, Author: Benson, H.J., Publisher: Benjamin Cummings

10. Subsequent Courses:
BI 315, 410, 416, & 419

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 302

Course Title: Plant Diversity Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Fall/Even Years

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. Catalog Description:

Students learn principles of modern botanical systematics and phylogeny through observing and describing characteristics of photosynthetic organisms, especially the algal protests. Students learn to use research-level photomicroscopy to document and describe biodiversity among the eukaryotic microbiota of Guam. Prerequisite: BI 157-157L and BI 158-158L or equivalent. Corequisite: BI 302L

2. Course Content:

This course will survey some of the major lines of photosynthetic organisms to explore the reasons why this new phylogenetic scheme has replaced the old "Five-Kingdom" system, in which green plants were split between Protista and Plantae, and Fungi were usually incorporated into botany courses. While the bulk of the diversity among photosynthetic organisms occurs among the algae, we will also follow the phylogeny of land plants, recognizing their importance to humans. Here, too, we will contrast the modern phylogeny with the older system (e.g., monocots vs. dicots in the flowering plants) to understand the dynamic nature of the field and the opportunities for future research.

The microscopy part of the course will train students in the use of different types of illumination, using research-level photomicroscopes, and will engage students in study of local freshwater and marine biodiversity among the photosynthetic protests.

3. Rationale for the Course:

Modern understanding of the Tree of Life incorporates knowledge of structure and ultrastructure, life histories and reproduction, and gene sequences. There are presently 5 or 6 "Supergroups" within the Eukaryota, with photosynthetic organisms concentrated into two of these - Archaeplastida and Chromalveolates. Land plants represent the end of one branch with Archaeplastida and animals and fungi are closely related in the supergroup Opisthokonts, which contain some organisms photosynthetic through symbiosis. Bi 302 contributes explicitly to the following goals of the Biology BA Program: (1) Disciplinary knowledge of systematics and island biodiversity; (2) Research/laboratory skills in the microscopy, observation and drawing; (3) Communication skills by writing a lab report; (4) Digital Literacy in taking and processing digital images and producing a report and a presentation.

4. Skills and Background Required or Expected:

Familiarity with major plant/protist groups and the principles of classification at the level of BI 157-158 and the ability to operate compound and dissection microscopes effectively with bright-field illumination.

5. Teaching Methodologies and Anticipated Class Size:

Skills development through integrate lecture and labs will focus in improvement in three key skills areas:

Identification, observation. Identifying a species (plant or animal) often involves three skills: picking out key characters, comparing a real specimen to line drawings or photos, and being able to compare a specimen to written descriptions. All these involve making informed observations about the specimen. Lab drawings will help students sharpen these skills.

Thinking and arguing in science. Systematics is now a dynamic field with new data and ideas flowing in and requiring us to rethink the "classical" systematics based on morphologies (as laid out in most textbooks). Students will practice judging scientific hypotheses and writing scientific arguments to make a case.

Scientific research. Students will refine their knowledge of and skills in scientific research by conducting real biodiversity studies in freshwaters of Guam, reading scientific papers, and writing a scientific report.

Anticipated class size: 10–15.

6. Learning Objectives for Students:

- identify unknown plants to the taxonomic level appropriate for that group and be able to say why
- know the higher taxonomic groups and their characteristics and be able to compare and contrast them
- use characteristics of organisms and higher taxa to assess the systematic placement of taxa
- use criteria to identify specimens, and work with differing classification schemes and the criteria and philosophy that underlie them.
- use the principles of microscopy to select appropriate illumination and other settings on the microscopes in use to consistently obtain good images, and to solve problems with poor images.

In learning about biodiversity students will focus particular attention on comparative morphology and life cycles. This is not a course in species identification, though students will learn names for representative organisms and some others.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation: Monthly tests, term project, lab drawings and photographic image quality.

8. Methods for Student Learning Outcomes Assessment: See 7.

In addition, depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Depending on availability of suitable textbooks.

10. Subsequent Courses:

BI 365, Taxonomy of Vascular Plants; BI 474G, Marine Botany.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 302L

Course Title: Plant Diversity Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Fall Even Years

Course counts as: _____ general education requirement
_____ part of _____ major program
_____ elective

1. Catalog Description:

BI 302L is the laboratory portion of BI 302 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI 302

2. Course Content:

3. Rationale for the Course:

4. Skills and Background Required or Expected:

5. Teaching Methodologies and Anticipated Class Size:

Anticipated class size:

6. Learning Objectives for Students:

1. Identify unknown plants to the taxonomic level appropriate for that group and be able to say why.
2. Know the higher taxonomic groups and their characteristics and be able to compare and contrast them.
3. Use characteristics of organisms and higher taxa to assess the systematic placement of taxa.
4. Use criteria to identify specimens, and work with differing classification schemes and the criteria and philosophy that underlie them.
5. Use the principles of microscopy to select appropriate illumination and other settings on the microscopes in use to consistently obtain good images, and to solve problems with poor images.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation

9. Required and Recommended Texts or Study Guides:

10. Subsequent Courses:

11. Additional Course Descriptors, if any:

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 303

Course Title: Animal Diversity Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Spring/Odd Years

Course counts as: X general education requirement
X part of Biology major program
X elective

1. Catalog Description:

This course is a phylogenetic survey of the animal Protista and Animalia with emphasis on structure and function of major phyla. It includes three hours of lecture weekly. The lab, BI 303L, MUST be taken concurrently. Prerequisite: BI 157-157L and BI 158-158L, or equivalent. Corequisite: BI 303L

2. Course Content:

Taxonomy, phylogeny, morphology and physiology of animal-type protists and members of the animal kingdom. Lab permits detailed examination of selected species.

3. Rationale for the Course:

Biology majors can utilize information about animals, especially within a framework of evolutional history and relationships, and structure as it relates to function.

4. Skills and Background Required or Expected:

BI 157/157L and BI 158/158L or equivalent

5. Teaching Methodologies and Anticipated Class Size:

Lecture sessions are taught by lecturing; student recall and review are encouraged by questioning. Lab sessions involve examination of representative organisms using microscopes and dissection techniques. Course is taught every other year, so about 18-20 students are usual.

Anticipated class size: 18-20 students

6. Learning Objectives for Students:

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Define and apply scientific terms relating to evolution, phylogeny, morphology & physiology of selected animal phyla;
2. Utilize techniques of microscopy and dissection to observe and characterize animal structures and functions;

and
3. compare and contrast animal structures in relation to evolutionary aspects.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

- Students take written tests in lecture.
- Students take practical examinations in laboratory.
- During some semesters students have presented papers, but this has not been done every semester.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Animal Diversity, 4th edition, Publisher: Brown

10. Subsequent Courses:

Knowledge gained in a science course makes any subsequent science course easier. This is a course particularly appropriate for further work in Animal Behavior, Evolution, Ecology, Invertebrate Zoology, Comparative Vertebrate Anatomy, etc.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 303L

Course Title: Animal Diversity Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Spring/Odd Years

Course counts as: X general education requirement
X part of Biology major program
X elective

1. Catalog Description:

BI 303L is the laboratory portion of BI 303 and MUST be taken concurrently. The course consists of one three hour laboratory period per week. Corequisite: BI 303

2. Course Content:

Taxonomy, phylogeny, morphology and physiology of animal-type protists and members of the animal kingdom. Lab permits detailed examination of selected species.

3. Rationale for the Course:

Biology majors can utilize information about animals, especially within a framework of evolutional history and relationships, and structure as it relates to function.

4. Skills and Background Required or Expected:

BI 157/157L and BI 158/158L or equivalent

5. Teaching Methodologies and Anticipated Class Size:

Lab sessions involve examination of representative organisms using microscopes and dissection techniques. Course is taught every other year, so about 18-20 students are usual.

Anticipated class size: 18-20 students

6. Learning Objectives for Students:

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Define and apply scientific terms relating to evolution, phylogeny, morphology & physiology of selected animal phyla;
2. Utilize techniques of microscopy and dissection to observe and characterize animal structures and functions; and

3. Compare and contrast animal structures in relation to evolutionary aspects.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

- Students take practical examinations in laboratory.
- During some semesters, students have presented papers, but this has not been done every semester.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Animal Diversity Lab Manual, Latest Edition, Author: Cleveland P. Hickman, Jr. & Larry S. Roberts; Publisher: William C. Brown

10. Subsequent Courses:

Knowledge gained in a science course makes any subsequent science course easier. This is a course particularly appropriate for further work in Animal Behavior, Evolution, Ecology, Invertebrate Zoology, Comparative Vertebrate Anatomy, etc.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 310

Course Title: Evolution Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Spring/Odd Years

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. Catalog Description:

This course is an introduction to the modern theory of evolution. The focus of the course is on the mechanisms that cause the evolution of adaptations and new species. The pattern of evolution in the fossil record is analyzed to understand the causes of speciation and extinction patterns. The ability of evolutionary theory to inform studies in other areas of biology (such as genetics, morphology, and ecology) is stressed. The course consists of three hours of lecture weekly. Prerequisite: BI 157-157L and BI 158-158L, or permission of instructor. Corequisite: BI 315L.

2. Course Content:

The course will begin with an introduction to theories of the origin of life. The origin and evolution of the major groups of organisms will be presented in relation to the geological time scale. Proposed causes of the major extinctions in the fossil record will be discussed. The mechanisms of species formation will be compared with experimental evidence for each mechanism. The action of natural selection in creating adaptive evolution will be outlined. The role of genetic variation in providing material for the action of natural selection will be presented. Evolution of the human species in both its biological and cultural aspects will be discussed.

3. Rationale for the Course:

A modern training in biology requires an insight into the major causes of the biological patterns that we observe. Evolutionary theory integrates in a mechanistic way such topics as genetics, morphology, physiology, and ecology. No course in the undergraduate curriculum currently fills this need.

4. Skills and Background Required or Expected:

This is a course for undergraduate students (for both biology majors and students majoring in related areas). An introductory biology course is required. Classes in genetics and basic mathematics (such as algebra) are also useful.

5. Teaching Methodologies and Anticipated Class Size:

Three 1-hour lectures per week.
Anticipated class size: 15-20 Students

6. Learning Objectives for Students:

1. Define the differences between the theory of evolution by natural selection and alternative explanations.
2. Calculate the divergence times of species using a molecular clock.
3. Differentiate between the concepts of environmental modification, adaptation, and pre-adaptation.
4. Construct a phylogeny using the methods of phylogenetic systematics.
5. Calculate the relative influences of individual genetic differences and environmental influences on the phenotypes in a population sample.
6. Write a critique of a brief scientific paper, e.g., from *Nature* e.g., Are the methods appropriate for the hypothesis or research question? Do the data support the hypothesis? What are key and hidden assumptions, conflicting viewpoints?

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Weekly quizzes, a mid-term and a final exam.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observations; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Evolution, 1st. edition, Author: Futuyma, Publisher: Sinauer

10. Subsequent Courses:

This course would provide a background to more advanced courses in genetics and evolution (such as the graduate course (BI 525) in evolutionary biology or a course in population or molecular genetics).

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 315

Course Title: General Genetics Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Fall Odd Years

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. Catalog Description:

Basic principles of heredity, including biochemical genetics and populations aspects, are covered. The course includes three hours of lecture weekly. The lab, BI 315L, MUST be taken concurrently. Prerequisite: BI 157-157L and BI 158-158L or permission of instructor. Corequisite: BI 315L

2. Course Content:

(1) Basic principles of Mendelian genetics. (2) Nature of the gene. (3) Molecular genetics (prokaryotes). (4) Molecular genetics (eukaryotes). (5) Molecular genetic mechanisms of development. (6) Population genetics. (7) Quantitative genetics. (8) Genetics and evolution.

3. Rationale for the Course:

Genetics is a basic element in the understanding of biochemistry, cell biology, developmental biology and evolution. It provides fundamental concepts that explain how biochemical changes at the cellular level cause changes in more complex phenotypes that are the products of evolution.

4. Skills and Background Required or Expected:

This course assumes no background in biology other than the introductory biology sequence. Basic concepts of biochemistry, experimental design and statistical analyses of data will be provided during the course. This is a course designed to be suitable for all biology majors while providing a background for more advanced genetic courses (e.g., molecular genetics, population genetics).

5. Teaching Methodologies and Anticipated Class Size:

Three one-hour lectures per week. Material included in the text will be supplemented with more focused readings on key topics using reprints from Scientific American and other sources. Lecture periods will include time for discussion.

Anticipated class size: 24 students

6. Learning Objectives for Students:

1. Determine the mode of inheritance of various traits using a pedigree.

2. Outline the chemical structure of DNA and RNA.

3. Differentiate between the mechanisms of DNA replication, transcription, and translation.

4. Measure the degree of genetic polymorphism among individuals in a population using modern laboratory methods, e.g., PCR to obtain data for population genetic models.

5. Apply bacterial transformation, viral transduction, and bacterial conjugation to modify laboratory strains of bacteria.

6. Solve problems in molecular and population genetics, including designing experimental protocols with relevant statistical analyses.

7. Compare your team's results with that of other groups to troubleshoot and improve experimental protocols.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Three exams (including a final exam), weekly quizzes and/or problem sets, and weekly laboratory reports.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Introduction to Genetic Analysis, 9th. edition, Author: Griffiths, et.al, Publisher: W.H. Freeman

10. Subsequent Courses:

A course in evolutionary biology could be taken at the same time or after this course. Also, the course will provide a background for cell biology, molecular biology and a possible graduate course in population genetics.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 315L

Course Title: General Genetics Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Fall Odd Years

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. Catalog Description:

BI 315L is the laboratory portion of BI 315 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI 315.

2. Course Content:

(1) Basic principles of Mendelian genetics. (2) Nature of the gene. (3) Molecular genetics (prokaryotes). (4) Molecular genetics (eukaryotes). (5) Molecular genetic mechanisms of development. (6) Population genetics. (7) Quantitative genetics. (8) Genetics and evolution.

3. Rationale for the Course:

Genetics is a basic element in the understanding of biochemistry, cell biology, developmental biology and evolution. It provides fundamental concepts that explain how biochemical changes at the cellular level cause changes in more complex phenotypes that are the products of evolution.

4. Skills and Background Required or Expected:

This course assumes no background in biology other than the introductory biology sequence. Basic concepts of biochemistry, experimental design and statistical analyses of data will be provided during the course. This is a course designed to be suitable for all biology majors while providing a background for more advanced genetic courses (e.g., molecular genetics, population genetics).

5. Teaching Methodologies and Anticipated Class Size:

Three one-hour lectures per week. Material included in the text will be supplemented with more focused readings on key topics using reprints from Scientific American and other sources. Lecture periods will include time for discussion.

Anticipated class size: 24 students

6. Learning Objectives for Students:

1. Determine the mode of inheritance of various traits using a pedigree.
2. Outline the chemical structure of DNA and RNA.

3. Differentiate between the mechanisms of DNA replication, transcription, and translation.
4. Measure the degree of genetic polymorphism among individuals in a population using modern laboratory methods, e.g., PCR to obtain data for population genetic models.
5. Apply bacterial transformation, viral transduction, and bacterial conjugation to modify laboratory strains of bacteria.
6. Solve problems in molecular and population genetics, including designing experimental protocols with relevant statistical analyses.
7. Compare your team's results with that of other groups to troubleshoot and improve experimental protocols.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Three exams (including a final exam), weekly quizzes and/or problem sets, and weekly laboratory reports.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

None required, however, hand-outs are given to students

10. Subsequent Courses:

A course in evolutionary biology could be taken at the same time or after this course. Also, the course will provide a background for cell biology, molecular biology and a possible graduate course in population genetics.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 320

Course Title: Biodiversity Photomicroscopy: Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: _____ general education requirement
_____X_____ part of Biology BA major program
_____ elective

1. Catalog Description:

Effective use of digital photomicrography and presentation software to write, illustrate and orally present a structurally correct and cohesive laboratory report or journal note using scientific format and the appropriate discourse genres for each section. Prerequisites; BI 157 and 158, BI 120 and EN 111 or permission of instructor. Students are expected to be enrolled in upper division biology/chemistry courses.

2. Course Content:

In Biodiversity Photomicroscopy (Science Communication 2), students effectively use digital photomicrography and presentation software (PhotoShop, PowerPoint, MSWord) to write, illustrate and orally present a structurally correct and cohesive laboratory report, almost a journal article, following the scientific format and the appropriate discourse genres for each section. Students construct effective photodocumentation, tables, graphs, and diagrams using graphics hardware and software including spreadsheets. Students learn instrumentation skills on photomicroscopes with digital cameras. Students integrate information on biodiversity from various sources and media types; they conduct a limited literature review gap analysis, effectively reading scientific prose and accompanying illustrations; they hone skills to summarize, infer, and identify supporting details. With their records of organisms new for Guam, students have opportunities to co-author a paper for submission to a scientific journal. Students apply criteria to discriminate among ethically correct and effective ways of presenting data. Students deconstruct and write a structurally correct draft journal article, following the "IMRAD" formula (Introduction, Methods and Materials, Results, and Discussion), using the appropriate discourse genres for each section of the report. Major skill groupings include Information Technology, and Biological English writing with study reading for science. Coordinated biology laboratory courses may include: BI 302 Plant Diversity, BI 410 Ecology or BI 474 Marine Botany.

3. Rationale for the Course:

Effective scientific communication skills, e.g., photodocumentation, are essential for success in Biology. Undergraduate biology students and people working in science are expected to create and to interpret scientific illustrations in reports and journal articles. An explicit component of science communication is included in the Biology program goals, in alignment with national curriculum expectations. The series of three Science Communications courses provide the groundwork in scientific communication that supports reading, writing, and research in other biology courses. In this courses, students focus on digital photomicrography and data presentation.

Science Communication courses provide explicit support for Biology BA program goals #4 (Communication) and #5 (Digital Literacy).

4. Skills and Background Required or Expected:

Students are expected to have completed BI 120 Scientific Prose (Science Communication 1), BI 157 and BI 158 Principles of Biology, and be enrolled in upper division biology or chemistry courses or have permission of instructor. If they are uncertain about being ready for the course, they should consult the professor for suggestions to improve their skills.

5. Teaching Methodologies and Anticipated Class Size:

Teaching methodologies: Students will have the opportunity to learn from several methods in a workshop format -mini-lectures assisted by PowerPoint visuals, in-class and homework discussions with peers, guided practice with the skills in each unit, and participation in and written reflection on lectures by at least two visiting or local researchers—likely scheduled by the Biology Club, UOG Marine Lab, Professors, CLASS Research Conference, or Guam Haggan Watch outside of our class time. Students will begin most assignments in class. Class will be held in the UOG NIH *RISE* Science computer lab, Sc 117.

Anticipated class size: 10-15.

6. Learning Objectives for Students:

Successful students in Science Communication 2 will –

1. Write and present a structurally correct draft journal article, poster slide and oral talk on their biodiversity research, following the "IMRAD" formula, using the appropriate discourse genres for each section of the report, including—effective photodocumentation, graphics software (Photoshop) and hardware (photomicroscope, scanner, digital camera for stills and brief videos), presentation software (Power Point), advanced word-processing features (MS Word), and spreadsheets (Excel) to construct, tables, graphs and diagrams and incorporate them into reports.
2. Apply criteria to discriminate among ethically correct and effective ways of presenting data.

Successful students in Science Communications II will:

1. Write and present a structurally correct draft journal article, poster slide and oral talk on their biodiversity research, following the "IMRAD" formula, using the appropriate discourse genres for each section of the report, including—effective photo documentation, graphics software (Photoshop) and hardware (photomicroscope, scanner, digital camera for stills and brief videos), presentation software (Power Point), advanced word-processing features (MS Word), and spreadsheets (Excel) to construct, tables, graphs and diagrams and incorporate them into reports.
2. Apply criteria to discriminate among ethically correct and effective ways of presenting data.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Homework, seatwork, in-class and take-home tests, scientific drawings, self-assessment.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Texts depend on availability of suitable textbooks year to year and on teacher-made materials. [As more recent texts that better support the intended learning outcomes become available, these may be substituted.]

Day & Gaster, *How to Write and Publish a Scientific Paper*, 6th ed. (recommended)
Lobban & Schefter (1992). *Successful Lab Reports* [UOG Bookstore, approx. $20] a.k.a. *SLR*
Lewis, N. (1979). *Word Power Made Easy*. New York, Simon & Schuster.
Additional scientific writing books, including: Day: *Scientific English*; Alley, *Craft of Scientific Writing* and *Craft of Scientific Presentations*; Matthews: *Successful Scientific Writing*; *CBE Style Manual* (available in classroom)
Huff & Geis: *How to Lie with Statistics*; Best: *Damned Lies & Statistics*

10. Subsequent Courses:

BI 321 Scientific Arguments (Science Communication 3); BI 503 (Scientific Literature and Writing).

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

JtD Updated April 1, 2008

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 321

Course Title: Scientific Arguments Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Spring

Course counts as: _____ general education requirement
X part of Biology BA major program
_____ elective

1. Catalog Description:

Writing and analyzing *scientific* arguments for effectively presenting scientific work and career aspirations facilitated by acceptance to graduate school. Prerequisites: BI 157 and 158, BI 120 and BI 320 or permission of instructor. Students are expected to be enrolled in upper division biology/chemistry courses.

2. Course Content:

Scientific Arguments (Science Communication 3) assists students to improve their skills for writing and analyzing *scientific* arguments, including for the Analytical Writing section of the Graduate Record Examination, and for effectively presenting scientific work and career aspirations. Students learn from practical workshops, in-class and out-of-class writing and discussion. Current topics may include biological aspects of local health and environmental issues, philosophy of science and biology, linguistic insights, and scientific research by UOG faculty or visitors.

Analyzing a scientific argument

Frameworks for critical reading of text
Analysis of introductions and discussions from scientific papers, mapping the flow of the argument
Logical fallacies
Tentative language
Writing a critique of an argument

Writing a scientific argument

Establishing criteria and weighing evidence
Organizing evidence into coherent arguments, using logic and topic sentences
Editing scientific prose at both substantive and sentence levels, using criteria to assess alternative phrasing.

Presentations: Oral, poster, journal articles; refine Statements of Purpose

Professional-quality poster and oral presentations with abstracts, simple research grant proposals, effective Statements of Purpose for graduate school,

3. Rationale for the Course:

Logical argument is critical to two key sections of a scientific paper: the introduction and the discussion. The introduction is an argument for why the study was worth doing (often presented as a "gap analysis"); the discussion includes arguments to show how the results support the hypothesis (or not) and the wider implications for the field. Writing and analyzing scientific papers requires abilities to both write and analyze arguments, two complex skills that the Graduate Record Examination (GRE) general exam requires. (Since October 2002, the GRE requires students to write an argument on a general topic and to analyze an argument.) Students' growing ability to write effective

academic arguments should assist them both with scoring high on the Graduate Record Exam (GRE) by Educational Testing Service (ETS) essays and with effective and efficient communication for science classes, research, and science careers.

Science Communication courses provide explicit support for Biology BA program goals #4 (Communication) and #5 (Digital Literacy).

4. Skills and Background Required or Expected:

Students are expected to be biology or chemistry majors enrolled in upper division biology courses. They should have completed SciComm 1 and 2, BI 157 and BI 158 Principles of Biology I and II -- or have permission of instructor. If they are uncertain about being ready for the course, they should consult the professor for suggestions to improve their skills.

5. Teaching Methodologies and Anticipated Class Size:

Teaching methodologies: Students will have the opportunity to learn skills from several methods in a workshop format with the three overlapping modules: mini-lectures assisted by PowerPoint visuals, in-class and homework discussions with peers, guided practice with the skills in each unit, and participation in and written reflection on lectures by at least two visiting or local researchers - likely scheduled by the Biology Club, UOG Marine Lab, Professors, CLASS Research Conference, or Guam Haggan Watch outside of our class time. Students will begin most assignments in class. Class will be held in the UOG NIH *RISE* Science computer lab, Sc 117.

Anticipated class size: 10–15.

6. Learning Objectives for Students:

Successful students in Science Communications 3 will--

1. Apply various ‘lenses" to analyze the structure of passages, i.e. critical thinking, ETS GRE rubrics for the issue and analysis essays, reasoning fallacies.
2. Write an effective argument and a presentation abstract.
3. Write an effective statement of purpose of graduate school and a simple grant proposal.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

yes, already submitted and approved

Evidence of ability to analyze and to write a variety of scientific arguments will be judged by scoring rubrics, including adaptations of Graduate Record Exam (GRE) criteria. Students write a self-assessment of relevant skills, reflecting on their learning and planning for continued learning. Active class participation, attendance, homework, quizzes, and exam(s) impact final grades. The weighting for learning objectives and other course elements is listed in the syllabus.

Attendance and homework are crucial for success. Homework will be used as evidence of student learning; homework is due 3 days before the next class for at least three reasons: (1) learning requires practice over time; (2) students need to have feedback and models before they move forward; (3) the professors need time to review the assignments, answer questions and modify the next lesson and assignments to enhance student learning.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Texts depend on availability of suitable textbooks year to year and on teacher-made materials. [As more recent texts that better support the intended learning outcomes become available, these may be substituted.]
Day, R.A. & E. Gaster. (2006) *How to Write and Publish a Scientific Paper*, 6th ed. (recommended)
GRE TestPrep, 7th ed [or later]. (2003). Des Plaines, IL: Cambridge Educational Services. [from classroom set]
Bromberg, M. & Liebb, J (2005). *601 Words You Need to Know*, 4th ed. Barron's [BestSeller bookstore approx. $11.95]

Additional scientific writing books, including: Day: *Scientific English*; Alley, *Craft of Scientific Writing* and *Craft of Scientific Presentations*; Matthews: *Successful Scientific Writing*; *CBE Style Manual* (available in classroom)
Huff & Geis: *How to Lie with Statistics*; Best: *Damned Lies & Statistics*

10. Subsequent Courses:

BI 503 (Scientific Literature and Writing).

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

JtD Updated April 1, 2008

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 333

Course Title: Comparative Vertebrate Anatomy Credit Hours: 3/1

Date of Final Approval: _____ Semester Offered: Spring Even Years

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. **Catalog Description:** This course is a study of the basic morphology of vertebrates, with lecture emphasis on the evolution of vertebrate systems and laboratory emphasis on dissection of these systems in selected vertebrates. It includes three hours of lecture weekly. The lab, BI 333L, MUST be MUST be taken concurrently. Prerequisite: BI 157-157L and BI 158-158L or equivalent. Corequisite: BI 333L

2. **Course Content:**

   Taxonomy, phylogeny, morphology and physiology of the animal vertebrates with lecture emphasis on the evolutionary patterns of vertebrate history and lab emphasis on the taxonomy and morphology of selected species.

3. **Rationale for the Course:**

   Biology majors can utilize information about vertebrate animals especially within a framework of evolutionary history and the relations of structure and function

   Pre-medical, pre-veterinary medicine, and zoology students can also get practice in lab/clinical techniques, particularly dissection and microscope work.

4. **Skills and Background Required or Expected:**

   Students are required to have taken BI 157 & BI 157L or their equivalent. In addition, previous experience to laboratory dissection techniques is highly recommended. Basic study and language skills are assumed and will be relied on to successfully complete this course.

5. **Teaching Methodologies and Anticipated Class Size:**

   Lecture sessions are taught by lecturing; student recall and review are encouraged by clue questioning. Lab sessions involve examination of representative vertebrates using microscopes and dissecting techniques. Course is taught every other year.

   Anticipated class size: 15-20 students

6. **Learning Objectives for Students:**

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Define and apply scientific terms relating to evolution, phylogeny, morphology & physiology of selected vertebrate animals;
2. Utilize techniques of microscopy and dissection to observe and characterize vertebrate structures and functions; and
3. Compare and contrast characteristic vertebrate structures, in lab and lecture, in relation to evolutionary

aspects.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

The primary basis of evaluation will be written exams in both lecture and lab. Overall understanding and retention of both lecture material is measured by a mid-terms, and a final exam. Procedures and analysis performed in lab will be sole basis of material covered in lab practical exams.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Comparative Vertebrae Analysis of Vertebrate Structure, 5th. edition, Author, Hildebrand, Publisher, John Wiley & Sons

10. Subsequent Courses:

Knowledge gained in a science course makes any subsequent science course easier. This is a course appropriate for further work in Animal Behavior, Animal Physiology, Evolution, Embryology or Animal Diversity.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 333L

Course Title: Comparative Vertebrate Anatomy Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Spring Even Years

Course counts as: X general education requirement
X part of Biology major program
X elective

1. **Catalog Description:** BI 333L is the laboratory portion of BI 333 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI 333

2. **Course Content:** Taxonomy, phylogeny, morphology and physiology of the animal vertebrates with lecture emphasis on the evolutionary patterns of vertebrate history and lab emphasis on the taxonomy and morphology of selected species.

3. **Rationale for the Course:**

   Biology majors can utilize information about vertebrate animals especially within a framework of evolutionary history and the relations of structure and function

   Pre-medical, pre-veterinary medicine, and zoology students can also get practice in lab/clinical techniques, particularly dissection and microscope work.

4. **Skills and Background Required or Expected:**

   Students are required to have taken BI 157 & BI 157L or their equivalent. In addition, previous experience to laboratory dissection techniques is highly recommended. Basic study and language skills are assumed and will be relied on to successfully complete this course.

5. **Teaching Methodologies and Anticipated Class Size:**

   Lecture sessions are taught by lecturing; student recall and review are encouraged by clue questioning. Lab sessions involve examination of representative vertebrates using microscopes and dissecting techniques. Course is taught every other year.

   Anticipated class size: 15-20 students

6. **Learning Objectives for Students:**

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Define and apply scientific terms relating to evolution, phylogeny, morphology & physiology of selected vertebrate animals;
2. Utilize techniques of microscopy and dissection to observe and characterize vertebrate structures and functions; and
3. Compare and contrast characteristic vertebrate structures, in lab and lecture, in relation to evolutionary aspects.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

The primary basis of evaluation will be written exams in both lecture and lab. Overall understanding and retention of both lecture material is measured by a mid-terms, and a final exam. Procedures and analysis performed in lab will be sole basis of material covered in lab practical exams.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

TEXTBOOK: Comparative Vertebrae Anatomy Lab – Vertebrae Dissection, 5th. Edition, Author, Warren/Walker, Publisher, Saunders College Publishing

10. Subsequent Courses:

Knowledge gained in a science course makes any subsequent science course easier. This is a course appropriate for further work in Animal Behavior, Animal Physiology, Evolution, Embryology or Animal Diversity.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 365

Course Title: Taxonomy of Vascular Plants Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Fall Odd Years

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. **Catalog Description:** This course covers the principles, practices, and significance of plant classification, as illustrated by the flora of Guam. It includes three hours of lecture weekly. The lab, BI 365L, MUST be taken concurrently. Prerequisite: BI 157-157L and BI 158-158L or equivalent. Corequisite: BI 365L

2. **Course Content:**

   Taxonomy, phylogeny and morphology of vascular plants. Lab permits detailed observations of selected species.

3. **Rationale for the Course:**

   Biology majors can utilize information about vascular plants especially within a framework of evolutionary history. Plants exert the dominant role in terrestrial habitats, and a knowledge of plants, particularly in the topics and on islands, is particularly useful.

4. **Skills and Background Required or Expected:**

   BI 157-158, and BI 157L-158L, or equivalent

5. **Teaching Methodologies and Anticipated Class Size:**

   Lecture is taught by lecturing, but after introductory meetings most lectures are conducted by the students.

   Lab involves the study of prepared specimens and the collection of local materials. Space (for materials – dryer, etc.) limits class size.

   Anticipated class size:

6. **Learning Objectives for Students:**

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Define and apply terms used for vascular plant evolution, phylogeny and morphology;
2. Use this information to present, orally & with demonstration materials, plant families and examples;
3. Collect and properly curate local plant specimens and identify them taxonomically using references from the scientific literature and university herbarium specimens; and
4. Utilize this information to identify specimens on lab practicals

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty

approved SLOs.

7. Methods of Evaluation:

Students take practical exams in lab.

Students present plant groups and are assessed as lecturers.

Students turn in plant collections of local materials.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

10. Subsequent Courses:

Knowledge gained in science course makes any subsequent science course easier. This is a course particularly useful for further work in Plant Diversity, Evolution and Ecology.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 365L

Course Title: Taxonomy of Vascular Plants Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Fall Odd Years

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. **Catalog Description:** BI 365L is the laboratory portion of BI 365 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI 365

2. **Course Content:**
   Taxonomy, phylogeny and morphology of vascular plants. Lab permits detailed observations of selected species.

3. **Rationale for the Course:**

   Biology majors can utilize information about vascular plants especially within a framework of evolutionary history. Plants exert the dominant role in terrestrial habitats, and a knowledge of plants, particularly in the topics and on islands, is particularly useful.

4. **Skills and Background Required or Expected:**

   BI 157-158, and BI 157L-158L, or equivalent

5. **Teaching Methodologies and Anticipated Class Size:**

   Lecture is taught by lecturing, but after introductory meetings most lectures are conducted by the students.
   Lab involves the study of prepared specimens and the collection of local materials. Space (for materials – dryer, etc.) limits class size.

   Anticipated class size:

6. **Learning Objectives for Students:**

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Define terms used for vascular plant evolution, phylogeny and morphology;
2. Use this information to present, orally & with demonstration materials, plant families and examples;
3. Collect and properly curate local plant specimens and identify them taxonomically using references and university herbarium specimens; and
4. Utilize this information to identify specimens on lab practicals

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Students take practical exams in lab.

Students present plant groups and are assessed as lecturers.

Students turn in plant collections of local materials.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

10. Subsequent Courses:

Knowledge gained in science course makes any subsequent science course easier. This is a course particularly useful for further work in Plant Diversity, Evolution and Ecology.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 410

Course Title: Ecology Credit Hours: 5

Date of Final Approval: _____ Semester Offered: Fall Even Years

Course counts as: X general education requirement
X part of Biology major program
X elective

1. **Catalog Description:** A study of fundamental concepts and methods of ecology illustrated by the examination of local natural systems; vegetational, faunal, and physical factors of the environment are considered. The course includes three hours of lecture weekly and six hours of laboratory weekly. Prerequisite: BI 157-157L and BI 158-158L or equivalent.

2. **Course Content:**

   Autecology, population, community and ecosystem ecology. Factors of man's impacts, including overpopulation, deforestation, pollution, introduction of exotics, etc.

3. **Rationale for the Course:**

   Senior students in biology have built up a fund of information which can be reviewed and integrated with other information. Both theoretical and practical ideas can be assessed.

4. **Skills and Background Required or Expected:**

   BI 157-157L, and BI 158-158L, or equivalent

5. **Teaching Methodologies and Anticipated Class Size:**

   Lecture sessions are taught by lecturing; student review and analysis are encouraged by questioning. Lab sessions involve practical experience analyzing local ecosystems using typical field methodologies and the production of several analytical papers.

   Anticipated class size: Class size: 20-25

6. **Learning Objectives for Students:**

During or by the end of the course students will be able to (as evaluated through written lab reviews, quizzes, and lab-practical exams):

1. Apply ecosystem concepts such as symbiosis, food chains and webs, physical & biological limiting factors, element cycles and energy flow, etc.;
2. Uilize field techniques and quantitative skills to measurement of ecological variables, e.g., gather population ecology data and test e.g., water temperature, hardness, pH, and salinity. Prepare data compilations using graphs, tables, and other scientific figures for processes involved in 1., above; and
3. Apply writing skills to produce, (4 with partners and independently), five scientific papers resembling environmental impact assessments of specific local ecosystems, using information obtained from field work,

techniques of 1 & 2, above, and from scientific literature.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. Methods of Evaluation:

Hour exams.

Field trip reports are the most important methods of evaluation.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Field and Laboratory Methods for General Ecology, 4th edition or newest, Author: Brower, Zar & VanEnde, Publisher: McGraw Hill

10. Subsequent Courses:

Ecology should be a senior year course; it can lead to a plant taxonomy, animal diversity, marine biology/ecology course, but usually builds on information gained in those courses. Leads to Graduate School.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 412

Course Title: Biometrics Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: _____ general education requirement
_____X_____ part of Biology major program
_____ elective

1. **Catalog Description:** This is a basic course in the design and analysis of biological experiments. Emphasis is given to analysis of biological and medical data. The course consists of three hours of lecture weekly. The lab, BI 412L, MUST be taken concurrently. Prerequisite: College Algebra, BI 157-157L and BI 158-158L or equivalent. Corequisite: BI 412L

2. **Course Content:**
   See attached Lecture Schedule

3. **Rationale for the Course:**
   This is a required course for all graduate students in Biology because the ability to design and analyze the data of biological experiments is essential for any thesis or professional research work.

4. **Skills and Background Required or Expected:**
   College Algebra

5. **Teaching Methodologies and Anticipated Class Size:**
   Fifty-four (54) 80-minute lectures and one field trip; often computer-work in class

   Anticipated class size: 10-15

6. **Learning Objectives for Students:**
   During or by the course end the student will:
   1. define mathematical terms related to statistics and probability theory as it is applied in biology;
   2. use a computer scripting language to write programmers of inferential statistical tests; and
   3. design biological experiments based on a sound statistical basis

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. **Methods of Evaluation:**
   Three take-home exams, allowed 2 weeks for each

8. **Methods for Student Learning Outcomes Assessment:**
   Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:
Statistical Tables, 3rd edition, Author: Sokal & Rohlf, Publisher: Freeman

10. Subsequent Courses:

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

JtD Updated April 1, 2008

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 412L

Course Title: Biometrics Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Fall

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. **Catalog Description:** BI 412L is the laboratory portion and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI 412

2. **Course Content:**
   See attached Lecture Schedule

3. **Rationale for the Course:**
   This is a required course for all graduate students in Biology because the ability to design and analyze the data of biological experiments is essential for any thesis or professional research work.

4. **Skills and Background Required or Expected:**
   College Algebra

5. **Teaching Methodologies and Anticipated Class Size:**
   Fifty-four (54) 80-minute lectures and one field trip; often computer-work in class
   Anticipated class size:

6. **Learning Objectives for Students:**
   During or by the course end the student will:
   1. define mathematical terms related to statistics and probability theory as it is applied in biology;
   2. use a computer scripting language to write programmers of inferential statistical tests; and
   3. design biological experiments based on a sound statistical basis

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs

7. **Methods of Evaluation:**
   Three take-home exams, allowed 2 weeks for each

8. **Methods for Student Learning Outcomes Assessment:**
   Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:
Statistical Tables, 3rd edition, Author: Sokal & Rohlf, Publisher: Freeman

10. Subsequent Courses:

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

JtD Updated April 1, 2008

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 416

Course Title: Cellular Physiology Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Spring Even Years

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. Catalog Description:

Principles of cellular activity, mechanisms of energy exchange and nutrition, and structure and function at the cellular and sub-cellular levels of organizations are examined. This course includes three hours of lecture weekly. The Lab, BI 416L, MUST be taken concurrently. Prerequisite: CH 310a, CH 311, CH 310b and CH 312 or concurrent enrollment, BI 157-157L and BI 158-158L or equivalent. Corequisite: BI 416L

2. Course Content:

This course will focus on the molecular cell approaches that have led to a greater understanding of the structure and function of the cell. Principle topics include cellular macromolecules, membrane structure & membrane transport, cell nucleus & gene expression, cell signaling, the immune system, and cancer biology.

3. Rationale for the Course:

Modern Biology has experienced an explosive growth in new molecular techniques and discoveries, in recent years. This has led to the accumulation of new information and a massive expansion of the field of cell biology. There is a tremendous need to find rational explanations and unifying concepts from a large and rapidly evolving body of knowledge, in order to understand the mechanism by which the cell functions as well as the molecular basis of disease.

The Cell Physiology course will provide a survey and principles of modern cell biology as well as new techniques of analysis at the molecular level. Current issues of importance as related to human health will be presented and hypothesis ventured in the areas that are poorly understood. This course will prepare students interested in careers in bio-medical research, medicine, biotechnology & agriculture related industries

4. Skills and Background Required or Expected:

Students are required to have taken the Principles of Biology lecture & laboratory course (BI157-157L and BI158-158L) as well as Organic Chemistry lecture and laboratory course (CH310a&CH310b, and CH311 &CH312).

5. Teaching Methodologies and Anticipated Class Size:

This course will involve lecture and laboratory activities. Formal lectures will be delivered using powerpoint in order to present models of cellular structure and function The lecture will be presented in an interactive style to encourage student participation in discussions

Twenty students are expected to enroll for the lecture course.

6. Learning Objectives for Students:

The student is required to demonstrate the ability :

(i) To define and describe fundamental concepts in the functioning of the cell
(ii) To define the relationship between molecular structure and cellular function

(iii) To define the dynamic character of cellular organelles
(iv) To define the use of chemical energy in running cellular activities and ensuring accurate macromolecular biosynthesis
(v) To define the unity and diversity at the macromolecular and cellular levels
(vi) To define and elaborate the mechanisms that regulate cellular activities
(vii) To learn and apply mathematical equations, where appropriate, in understanding cellular functions.
(viii) To elaborate the key experimental approaches and research methodologies that allow conclusions to be made in investigating cellular function.
(ix) To elaborate on the human perspective in investigating cellular function by describing the disruption of activities at the cellular and molecular level that leads to disease.
(x) To describe the importance of basic research as the pathway to understanding and eventually treating most human disorders.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

There will be three examinations. The nature of the questions will be of three different kinds : simple review questions; more challenging thought questions; and problems based on experimental data. Questions may also involve explaining and providing diagrams for cellular processes, analyzing data, proposing mechanisms, etc. The format of the questions may be multiple choice, essay type, and/or figures and schematic diagrams..

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Cell and Molecular Biology: Concepts and Experiments, Latest edition, by Gerald Karp, Wiley Publishers

10. Subsequent Courses:

Cell Physiology course will prepare students for further specialized courses like Molecular Biology & Biotechnology, Immunology; Developmental Biology; Neurobiology.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the “Americans with Disabilities Act” (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 416L

Course Title: Cellular Physiology Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Spring Even Years

Course counts as: _____ general education requirement
X part of Biology major program
_____ elective

1. Catalog Description:

BI 416L is the laboratory portion of BI 416 and MUST be taken concurrently. The course consists of one three hour laboratory period per week. Corequisite: BI 416

2. Course Content:

This course will focus on the molecular cell approaches that have led to a greater understanding of the structure and function of the cell. Principle topics include preparation of biological buffers, oil immersion light microscopy.

3. Rationale for the Course:

Modern Biology has experienced an explosive growth in new molecular techniques and discoveries, in recent years. This has led to the accumulation of new information and a massive expansion of the field of molecular cell biology. There is a tremendous need to find rational explanations and unifying concepts from a large and rapidly evolving body of knowledge, in order to understand the mechanism by which the cell functions as well as the molecular basis of disease.

The Cell Physiology lab course will provide students with hands-on experience in molecular cell techniques for analysis of the cell, the fundamental unit of life. This course will prepare students interested in careers in bio-medical research, medicine, biotechnology & agriculture related industries

4. Skills and Background Required or Expected:

Students are required to have taken the Principles of Biology lecture & laboratory course (BI157-157L and BI158-158L) as well as Organic Chemistry lecture and laboratory course (CH310a&CH310b, and CH311 &CH312).

5. Teaching Methodologies and Anticipated Class Size:

The labs will be designed to introduce basic cell biology techniques and molecular approaches to investigate the structure and function of cells. Students will be required to submit formal lab reports in scientific journal style on the lab work that they perform.

Twenty students are expected to enroll for the lecture course and will be distributed in two laboratory sections in order to make the limited equipment and resources more accessible to the students.

6. Learning Objectives for Students:

(i) To learn to launch a scientific investigation in understanding the cell, the basic unit of life.
(ii) To learn the concept and preparation of biological buffers
(iii) To learn the use of oil immersion light microscopy and phase contrast microscopy, to examine prokaryotic (bacteria) and eukaryotic (yeast, human) cells
(iv) To learn basic microbiological procedures for culturing bacterial and yeast cells used routinely in gene cloning.
(v) To learn the preparation of Drosophila polytene chromosome squashes in order to understand the concepts of chromatin and gene replication and expression.
(vi) To learn the use of differential stains to identify the key biological macromolecules, DNA, RNA, and Proteins present in polytene chromosomes.
(vii) To learn the fundamental concept of "recombinant DNA technology" and its usefulness in investigating cellular physiology
(viii) To learn identification, isolation, and manipulation of cellular macromolecules (genomic DNA, plasmid DNA, RNA, Proteins).
(ix) To learn the use of instrumentation like the UV/Visible Spectrophotometer, DNA & protein gel electrophoresis apparatus, Table-top Centrifuges, UV transilluminator, and Electroporator to introduce DNA into host cells.
(x) To learn to construct a human genomic library construction project and screen for isolation of genes.
(xi) To learn gene expression & control, performing experiments using the E.coli arabinose operon as a model system.
(xii) To learn the key immunological concept of antigen-antibody reaction using diffusion agar plates and in preparation for theoretical aspects of immunology presented in the lecture class.
(xiii) To learn to interact with fellow students and take responsibility for their part in the group work conducted in the laboratory.
(xiv) To learn to write a detailed laboratory report in the form of a research publication on a molecular cell project conducted in the laboratory.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

The laboratory component of the course will be graded on the basis of lab performance and conduct, lab reports, quizzes, and written exams.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Cell and Molecular Biology: Concepts and Experiments, Latest edition, by Gerald Karp, Wiley Publishers

10. Subsequent Courses:

Cell Physiology course will prepare students for further specialized courses like Molecular Biology & Biotechnology, Immunology; Developmental Biology; Neurobiology.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI/CH 419

Course Title: Biochemistry Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Spring Odd Years

Course counts as: _____ general education requirement
X part of Biology/Chemistry major program
_____ elective

1. Catalog Description:

This course covers the principles of protein chemistry and enzyme nomenclature, catalysis, kinetics and control. It includes three hours of lecture weekly. The lab, BI/CH419L, MUST be taken concurrently. Prerequisite: CH 310a, CH 311, CH 310b and CH 312 or concurrent enrollment, BI 157-157L and BI 158-158L or equivalent. Corequisite: BI/CH 419L

2. Course Content:

A. Lecture:

1. A Historical Review
2. Chemical Elements and Biogeochemical Cycles
3. Water as the Solvent of Life.
4. Some Basic Aspects of the Chemistry Life.
5. Cells: Biological Units of Molecular Organization.
6. Proteins I: Amino Acid Components and Structural Features.
7. Proteins II: Determination of Amino Acid Sequences.
8. Proteins III: Structure and Function.
9. Protein IV: Enzymes.
10. B-Vitamins and Coenzymes.
11. Carbohydrates.
12. Lipids and Membranes.
13. Nucleic Acids.
14. Energy and Life.
15. Anaerobic Synthesis of ATP (Glycolysis) and Pentose Phosphate Pathway.
16. Aerobic Synthesis of ATP I: Tricarboxylic Acid Cycle.
17. Aerobic Synthesis of ATP II: Electron Transport and Oxidative Phosphorylation.

3. Rationale for the Course:

This is an introductory course in biochemistry. It is intended for students in any field of science or engineering who want a one-semester introduction to biochemistry but who do not intend to be a biochemistry majors. Attempts will be made to make biochemistry as clear and interesting as possible and to familiarize all science students with the major aspects of biochemistry. The students will gain practical experience in basic laboratory techniques and enzyme kinetics.

4. Skills and Background Required or Expected:

Prerequisites are CH 310a, CH 311, CH 310b and CH 312 or concurrent enrollment.

5. Teaching Methodologies and Anticipated Class Size:

Three one-hour lectures and a three-hour laboratory per week. Material included in the text will be supplemented with assigned problems in enzyme kinetics, and in the preparation of buffer solutions.

Anticipated class size: 8-12 students.

6. Learning Objectives for Students:

(i) To learn the fundamental language of biochemistry, the major classes of biomolecules and the molecular logic of life.
(ii) To learn the structure and function of proteins and the latest methods and instrumentation used to analyze them.
(iii) To learn the importance of understanding the 3-D structure of proteins and the complex problem of protein folding and implications for neurodegenerative diseases.
(iv) To learn the structure and function of enzymes and the mechanism of enzyme catalysis and enzyme regulation in both health and disease.
(v) To learn the approaches and instrumentation employed in the emerging field of Proteomics paralleling the Genomics revolution.
(vi) To learn the basic principles of bioenergetics.
(vii) To learn the fundamentals and of metabolism and its regulation.
(viii) To learn the cellular generation of the chemical energy required for sustaining life.
(ix) To learn the fundamentals of the complex balance of the physical, chemical, and biological context in which each biomolecule, reaction, or pathway operates and the relationship between structure and function.
(x) To learn applications of biochemistry to problems in medicine, dentistry, agriculture, forensics, anthropology, environmental sciences, and other fields.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Weekly quizzes and/or problem set (20%), four exams including a final exam (55%) and laboratory reports (25%).

8. Methods for Student Learning Outcomes Assessment:

At the end of the course, the student should be able to:

-prepare buffer solutions.
-have a basic knowledge in biochemicals, such amino acids, carbohydrates, vitamins, lipids, enzymes, proteins and nuclein acid.
-have a modern understanding in enzyme kinetics, anaerobic and aerobic synthesis of ATP, electron transport and oxidative phosphorylation.

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

Molecular Biology of the Cell, Latest Edition by Alberts et al., Garland Publishing Inc.

10. Subsequent Courses:

This course will prepare students for undergraduate courses in biochemistry, cellular physiology, and other science courses in medical science.

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI/CH 419L

Course Title: Biochemistry Lab Credit Hours: 1

Date of Final Approval: _____ Semester Offered: Spring Odd Years

Course counts as: _____ general education requirement
X part of Biology/Chemistry major program
_____ elective

1. Catalog Description: BI/CH 419L is the laboratory portion of BI/CH 419 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: BI/CH 419

2. Course Content:

A. Laboratory Experiments (Handouts)

1. General Laboratory Procedures. (Record Keeping, Graphs and Numerical Results, Errors, Accuracy and Precision, Concentrations and Dilutions, Laboratory Safety)
2. Preparation of a Buffer; Measurement of pH.
3. Titration of an Unknown Amino Acid; Formal Titration.
4. Absorption Spectrum of Riboflavin.
5. Spectrophometric Methods for the Determination of Proteins.
6. Enzyme Assays and Enzyme Units: Amylase.
7. Acid-Catalyzed Hydrolysis of Sucrose.
8. Presentations of special biochemical topics by students.

3. Rationale for the Course:

This is an introductory course in biochemistry. It is intended for students in any field of science or engineering who want a one-semester introduction to biochemistry but who do not intend to be a biochemistry majors. Attempts will be made to make biochemistry as clear and interesting as possible and to familiarize all science students with the major aspects of biochemistry. The students will gain practical experience in basic laboratory techniques and enzyme kinetics.

4. Skills and Background Required or Expected:

Prerequisites are CH 310a, CH 311, CH 310b and CH 312 or concurrent enrollment.

5. Teaching Methodologies and Anticipated Class Size:

Three one-hour lectures and a three-hour laboratory per week. Material included in the text will be supplemented with assigned problems in enzyme kinetics, and in the preparation of buffer solutions.

Anticipated class size: 8-12 students.

6. Learning Objectives for Students:

(i) To learn the fundamentals of biochemistry laboratory science, including laboratory safety; scientific notation; significant figures in calculations; errors in experiments; accuracy *vs.* precision; international system of measurements; expressing concentrations of biochemical solutions; preparing dilutions; use of pipets and pipetman; analysis and interpretation of experimental data, and presentation of experimental data by preparing data tables, and graphs by hand and computer.

(ii) To perform titration experiments to learn the acid-base behavior of amino acids.
(iii) To conduct experiments in photometry and the use of both UV & visible spectrophotometer.
(iv) To perform, with the use of the Spectrophotometer, a series of experiments on enzyme kinetics and enzyme regulation & inhibition.
(v) To perform experiments in *in vivo* biochemistry, integrating genetics with biochemistry in order to learn the biochemical basis and approaches that are undertaken to explain genetic processes.
(vi) To learn molecular biochemical approaches to purify and characterize proteins, essential to investigating cellular and organismal physiology.
(vii) To learn two high tech instrumentation (HPLC and GC-MS), useful for biochemical analysis.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Weekly quizzes and/or problem set (20%), four exams including a final exam (55%) and laboratory reports (25%).

8. Methods for Student Learning Outcomes Assessment:

At the end of the course, the student should be able to:

-prepare buffer solutions.
-have a basic knowledge in biochemicals, such amino acids, carbohydrates, vitamins, lipids, enzymes, proteins and nuclein acid.
-have a modern understanding in enzyme kinetics, anaerobic and aerobic synthesis of ATP, electron transport and oxidative phosphorylation.

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

10. Subsequent Courses:

This course will prepare students for undergraduate courses in biochemistry, cellular physiology, and other science courses in medical science.

11. Additional Course Descriptors, if any: None

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 425/G

Course Title: Molecular Biology Credit Hours: 3

Date of Final Approval: _____ Semester Offered: Spring

_____general education requirement
__X__ part of Biology/Chemistry major program
_____elective

1. Catalog Description:

This course is designed for students who are planning on entering graduate and professional programs in the biological and medical sciences or careers in the biotechnology industry. This course highlights current concepts and trends in molecular biology as well as the latest developments in novel molecular approaches for detection and treatment of diseases. Selected topics in Immunology, Cardiovascular Biology, Tumor Viruses and Cancer Biology, Viral Pathogenesis, and Neurobiology are the focus of this course. Prerequisite: BI 416 & BI 416L, or equivalent. Corequisite: BI425/G/L

2. Course Content:

The course focuses on selected topics in the areas of Immunology, Cardiovascular biology, Tumor Viruses & Cancer biology, Viral (human) pathogenesis, Neurobiology. These topics will be examined in the light of current molecular approaches including Functional Genomics; DNA "Chip" Microarray Technology; Proteomics; Stem Cell Research; Chromatin & Transcriptional Regulation; and Gene Therapy.

3. Rationale for the Course:

The last two decades have seen an unprecedented growth in understanding of the science of life, biology, as well as the science of disease. The new field of Molecular Biology has provided powerful novel molecular approaches and tools to examine at the molecular level and propose fascinating molecular models of cellular function both in health and disease. Molecular Biology has revolutionized many fields of biology and medicine, including the areas of viral pathogenesis, cancer biology, and immunity. Molecular Biology techniques allow for the manipulation of genes and proteins outside living cells or organisms - "genetic engineering". These approaches have been exploited for diagnostic and prognostic applications in medicine, agriculture, cattle industry, and forensic medicine. The emerging area of "Gene Therapy" holds great promise in curing genetic diseases.

4. Skills and Background Required or Expected:

Students are required to have taken the BI 416 & BI 416L, Cell Physiology or an equivalent course.

5. Teaching Methodologies and Anticipated Class Size:

This course is taught in a lecture-discussion format. Format lectures may be followed by a discussion session where students debate on data and results obtained from selected articles published in recent molecular biology journals. Molecular Biology computer programs may be used to view molecular structures three-dimensionally, rotating and manipulating them on the computer screen and watching as they undergo their conformational change.

6. Learning Objectives for Students:

(i) To learn the fundamental and new concepts in understanding the structure and function of DNA, RNA, and Protein and gene regulation and the basis for the phrase "Genomics to Proteomics".

(ii) To learn the fundamental concepts of molecular medicine and the latest information on the molecular biological basis of health and disease.

(iii) To learn breakthrough developments in novel molecular approaches and instrumentation for the detection and treatment of diseases.

(iv) To learn research information on a wide variety of bio-medical topics including, stem cell research, cardiovascular biology, neurobiology, viral infection, cancer biology, and immunology.

(v) To analytically examine research publications, that investigate a specific disease and learn approaches and experiments that have been conducted, to explain the molecular basis of the defect.

(vi) To learn the use of standard and novel molecular approaches and latest instrumentation in investigating disease.

(vii) To evaluate the success and failures of the scientific investigation reported in selected research publications and speculate on the future prospects for finding a cure for the disease.

(viii) To learn, when appropriate, historical perspectives, news and views and ethical considerations of topics in molecular medicine.

(ix) To learn to apply molecular biology approaches to solve biomedical research questions and construct molecular models to explain biological phenomena.

(x) To examine and comment on video clips of key cellular events taken using "Video Microscopy" by various researchers in the field of molecular cell biology, in order to obtain glimpses of the fascinating processes that govern the living cell.

(xi) To learn the use of Kinemage (kinetic image) illustrations of biomolecules as an interactive computer display. Students will learn the main feature, interactive rotations to help visualize objects in 3-D in order to allow better communication of ideas that depend on 3-dimensional information.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Methods of evaluation may include midterms, research presentations, and a final examination on which students are tested for their ability to integrate molecular biology concepts, understand novel molecular approaches, and analyze experimental data.

In addition to the above undergraduate requirements, graduate students are required to review the data, results, & conclusions of selected bio-medical research papers. Students identify questions that are unanswered and propose one future experiment or approach that could be performed to provide further proof for the conclusions reached in the research papers.

8. Methods for Student Learning Outcomes Assessment:

Organize and integrate a range of interconnected molecular biology concepts.

Analyze the experimental evidence that supports the concepts and the novel molecular biology approaches that have provided detailed insights into cellular function.

Apply the molecular biology approaches and concepts to understanding the molecular basis of health and disease and the process of discovery.

Identify current trends in molecular biology and future research questions.

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

10. Subsequent Courses: None

11. Additional Course Descriptors, if any:

In addition to the undergraduate requirements, graduate students are assigned research papers on specific bio-medical topics published in current issues of scientific journals for in-depth study.

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

JtD Updated April 1, 2008

UNIVERSITY OF GUAM
COURSE OUTLINE

College: College of Natural and Applied Sciences Course Number: BI 425/G/L

Course Title: Molecular Biology Lab Credit Hours: 2

Date of Final Approval: _____ Semester Offered: Spring

Course counts as: _____ general education requirement
_____X_____ part of Biology/Chemistry major program
_____ elective

1. **Catalog Description:** BI 425/G/L is the molecular biology laboratory course that is taken concurrently with BI 425G. In this course, expression and control of eukaryotic genes is investigated in a research project format. Laboratory work involves the use of RNA & DNA techniques, protein methods, reporter gene assays, fluorescence microscopy, and the use of molecular biological computer databases to predict structure and function from nucleic acid & protein sequences. Prerequisites: BI416 & 416L, or equivalent. Corequisite: BI 425/G

2. **Course Content:**

   In this laboratory course, students investigate expression and control of eukaryotic genes in a research project format using specialized molecular biology techniques. Typically, students learn to identify, isolate, and manipulate a candidate gene; perform experiments to understand its regulation; and, isolate and characterize the expressed gene product. Finally, the students learn to use molecular biological computer databases and programs to predict structure and function from nucleic acid & protein sequences. Laboratory work involves the use of RNA & DNA techniques, protein methods, reporter gene assays, and fluorescence microscopy.

3. **Rationale for the Course:**

   The new field of Molecular Biology has provided powerful novel molecular approaches and tools to examine at the molecular level and propose fascinating molecular models of cellular function both in health and disease. Molecular Biology techniques allow for the manipulation of genes and proteins outside living cells or organisms - "genetic engineering". These approaches have been exploited for diagnostic and prognostic application in medicine, agriculture, cattle industry, and forensic medicine. The emerging area of "Gene Therapy" holds great promise in curing genetic diseases.

   The BI 425L, Molecular Biology Laboratory course provides UOG biology students first hand experience with using current molecular biology techniques and approaches. This course is conducted in a research project format, thereby enabling students to understand the methods involved in designing, undertaking and analyzing molecular biology experiments that are used in the molecular discovery process. BI 425L prepares students for graduate studies and research and other professional programs in the biological and medical sciences as well as for careers in the biotechnology industry.

4. **Skills and Background Required or Expected:**

   Students are required to have taken the BI 416 & BI 416L, Cell Physiology or equivalent course.

5. **Teaching Methodologies and Anticipated Class Size:**

   Students will perform laboratory experiments using equipment and supplies for molecular biology research that are currently available in the Division of Natural Sciences. Students may use the computer and internet facilities available

at the Library and UOG computer center in order to access molecular databases on-line for the analysis of DNA, RNA, and proteins as part of their laboratory work.

An anticipated class size would be 15 students distributed in two lab sections, with 7 or 8 students per section.

6. Learning Objectives for Students:

(i) To learn to launch specific scientific research investigations in the field of molecular biology and its application in biomedicine.
(ii) To learn to initiate a research project and take it to completion, presenting final reports for projects.
(iii) To prepare and present posters on projects undertaken in the laboratory course work, at the University of Guam College-Wide CLASS Annual Conference, in order to learn verbal and written scientific communicative skills and to learn to collaborate on a research project.
(iv) To learn the commitment and challenges a scientist experiences, the importance of collaboration with fellow scientists, and the importance of taking responsibility for their part in the project.
(v) To learn the use of computer technology in molecular biology research and to access a variety of molecular biology tools and databases available on various free web sites on the internet for the analysis of genes and protein 3-D structure & function, and for drug discovery.
(vi) To learn the physical principles of phase, fluorescence & confocal microscopy.
(vii) To learn preparation of slides of a eukaryotic cells and the use of special fluorescent dyes and the technique of Immunofluorescence Microscopy to detect and localize biomolecules.
(viii) To learn to perform and the usefulness of introduce foreign genes into host cells, expressing the genes and purifying and fundamental characterization of the proteins coded by the genes using molecular approaches and instrumentation.
(ix) To learn gene identification, manipulation, and isolation using a combination of various molecular biology approaches and techniques.
(x) To initiate a project on human oncogenes, coding for transcription factors and also implicated in cancer.

Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

7. Methods of Evaluation:

Methods of evaluation may include laboratory reports, midterms, and a final examination.

8. Methods for Student Learning Outcomes Assessment:

Depending on Instructor and Program faculty, any one or more of the following may be selected: Pre/Post Test; Course-embedded questions; Standardized Exams; Portfolio Evaluation; Direct Observation; and Capstone Course Evaluation.

9. Required and Recommended Texts or Study Guides:

10. Subsequent Courses: None

11. Additional Course Descriptors, if any: None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.

UNIVERSITY OF GUAM
COURSE OUTLINE

College: CNAS Course Number: BI 474/G

Course Title: Marine Botany Credit Hours: 4

Date of Final Approval: _____ Semester Offered: Spring / Even

Course counts as: _____ general education requirement
_____X_____ part of Biology (BA and MS) major program
_____X_____ elective

1. Catalog Description:

Students completing this course will have practical skills and knowledge of structure, reproduction and ecology of benthic marine algae in Guam and Micronesia, to work with these organisms in local contexts. Prerequisite: BI 302 or instructor's permission.

2. Course Content:

Study of benthic marine algae of Guam, with emphasis on the ability to recognize key features and to use technical descriptions and keys to identify algae. Familiarizing students with different survey techniques of algal assemblages and ecological data analysis will aid graduate students that conduct field work for their thesis project. Graduate students are expected to produce a report on a small independent research project, undergraduates are to produce a report based on available materials.

3. Rationale for the Course:

Algae, as the photosynthetic base of the marine food web and as structural components of coral reefs, are important in marine ecosystems and are often studied by fish biologists, marine natural products chemists, environmental and coastal resources managers, etc. This course provides the practical foundation for work with algae in these contexts. It supports the following Biology BA program goals:

#1. Disciplinary knowledge and skills at the organismal level, which can be applied to locally important issues;

#3. Research/laboratory skills in identification of organisms and use of microscopes;

#4. Communication skills in writing and presenting a report on algae;

#5. Digital literacy in preparing reports and using photomicroscopy.

It supports the Biology MS program goal of in-depth taxonomic knowledge, experience with survey techniques and data analysis when conducting ecological studies.

4. Skills and Background Required or Expected:

Students are expected to know the defining characteristics of the major groups of algae and to be able to assign unknown specimens to the correct phylum/class and to be able to use microscopes effectively for observation of living algal cells and tissues (outcomes of BI 302). Students will be able to evaluate and select appropriate sampling methodologies of algal assemblages to study specific ecological questions.

5. Teaching Methodologies and Anticipated Class Size:

Teaching methodologies: combined lecture-labs; the two three-hour periods each week will be cut up into short lectures and bench time, going back and forth between specimens and textbooks. Some structure in working through the various algal groups, when interesting or unusual specimens come to hand we will take time to learn about them and document them, even though this will sometimes mean that you get the details before you get a solid framework. A few field trips will be organized to illustrate and experience survey techniques. A subsequent computer lab will familiarize students with data entry in a database and the analysis of ecological data.

Anticipated class size: 10–15 (including 4-5 graduate students).

6. Learning Objectives for Students:

1. Identify at sight the common seaweeds to genus, and in some cases to species
2. Interpret technical descriptions of seaweeds for adequate use of keys to identify specimens to genus level

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3. Draw accurate interpretive diagrams of specimens
4. Use criteria in dichotomous keys to benthic algae
5. Prepare benthic algae for study (sectioning, mounting, clearing, etc. as appropriate)
6. Recognize reproductive and vegetative structures and use these in identification
7. Describe the roles and importance of algae in tropical marine ecosystems
8. Use a research photomicroscope for examining and documenting algal specimens with a variety of illumination (phase contrast, DIC, fluorescence)
9. Ability to conduct field surveys and data analysis to assess algal diversity and abundance

7. Methods of Evaluation:

In-class tests, drawings, project report.

8. Methods for Student Learning Outcomes Assessment:

Embedded questions in tests, project reports.

9. Required and Recommended Texts or Study Guides:

Depending on availability of suitable textbooks year to year.

10. Subsequent Courses:

None

11. Additional Course Descriptors, if any:

None

The Calendar of Assignments, Assessment Project, a Statement Concerning the "Americans with Disabilities Act" (ADA) Accommodations for Students, Attendance and Grading Policies are to be included in the course syllabus.